

**INVESTIGATING THE TRANSMISSION OF MONETARY POLICY
THROUGH THE BANK LENDING CHANNEL IN NAMIBIA**

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ABSTRACT

Investigating the transmission of monetary policy is important for an economy. Many channels exist through which monetary policy decisions affect the economy. This paper examines the bank lending channel, which reflects the central bank's actions that affect loan supply and real spending. It is necessary to understand how effective the channels of transmission are, in affecting economic activities in a given country. This study investigates the transmission of monetary policy through the bank lending channel in Namibia using four variables namely: gross domestic product (GDP), interest rate, inflation and bank lending. The study used a Vector Auto-regression (VAR) approach to estimate time series annual data from Q1 2009 to Q4 2018. The study employed techniques such as unit root tests, co-integration, impulse responses and variance decomposition. The co-integration test results revealed that co-integration exists among variables. The impulse response function showed that output growth responded negatively to repo rate. The increase in interest rate results in a decline in economic activities due to high interest on borrowing and thus a decrease in economic growth. The variance decomposition indicated that fluctuations in output growth were attributed to itself. While the total contribution of interest rate, bank lending and inflation was relatively insignificant. The error forecast of bank lending was attributed by itself with an insignificant contribution of output growth and non by interest rate and inflation. Fluctuations in forecasting interest rate were greatly attributed to bank lending and small contributions by the other variables. The error forecast of inflation was greatly dominated by itself. As the trend fell, there was a significant increase in the contribution of output growth and a slight contribution by the other variables.

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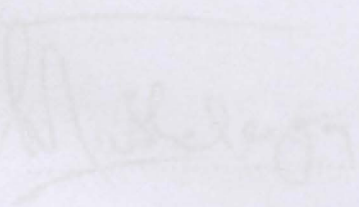
DEDICATION

This work is dedicated to my lovely mother, Hilja Kandali Iyambo may her soul rest in peace.
Continue watching over me my angel.

I hereby declare that this study is a true reflection of my own research, and that this work, or part thereof, has not been submitted for a degree in any other institution of higher education.

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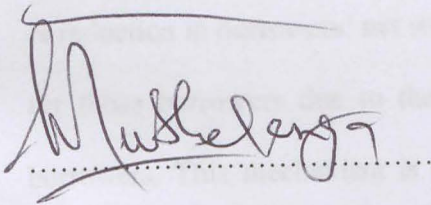
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CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The bank lending channel is a sub-component of the credit channel, and it is an important channel of the monetary policy transmission mechanism. A lot of scholars have examined the role played by the banks in the transmission of monetary policy aiming at uncovering a credit channel and assessing the relative importance of the money and credit channels. It is a macroeconomic variable that helps to drive economic activity; at the same time, it is also dependent on economic activity. For example, expenditure funded by claims on the private sector or bank loans will increase output, but at the same time strong output growth can stimulate the demand for loans or increase private sector claims to finance further expenditure such as investments (Sheefeni and Ocran, 2013, Berkelmans, 2005:1).

The fundamental of this mechanism is the market frictions generated by the existence of asymmetric information amidst market partakers. Bernanke and Gertler (1995), suggested two mechanisms for monetary policy changes to effect bank loan supply. The first one is the balance sheet channel which is based on the idea that monetary policy changes can affect the net worth of borrowers, which, in turn, affects the external finance premium borrowers face in credit markets. A reduction in borrowers' net worth translates into an upward shift in the bank loan supply curve for those borrowers due to the existence of asymmetric information among banks and their borrowers. This mechanism is however not specific to banks, since other lenders to firms or households are equally affected by it. The second mechanism is the bank lending channel. By comparison, it is based on the existence of asymmetric information among banks and their lenders. More specifically, a monetary policy tightening, since it translates into a decline in deposits, entails

a lower amount of loanable funds. To the extent that banks are unable to offset this reduction in loanable funds, due to informational frictions between them and their providers of funds, there will also be a fall in bank loan supply (Bernanke and Gertler, 1995).

1.2 Problem Statement

It is well acknowledged in the literature that banking institutions are the most important when it comes to credit extension, either to households or the corporate sector. Therefore, there has been a considerable amount of research in this regard investigating the role played by banks in the transmission of monetary policy, aiming at uncovering a bank lending channel and assessing its relative importance. The principal focus is on the reaction of the loan supply in response to monetary shocks (Howitt, 2006).

According to Abhay (2004) understanding the financial aggregates that are influenced by monetary policy changes enhances the understanding of the link between the financial and the real sectors of the economy. Secondly, understanding of the transmission mechanism enriches monetary authorities and analysts in interpreting movements in financial aggregates and thirdly, more information about the transmission mechanism results in better choices of intermediate targets. It is in this view that if the credit channel is important in the transmission of monetary policy changes, then banks' asset items become the focal point. Bernanke and Blinder (1988) also hinted on this view by stating that the role of financial intermediaries is a critical component when it comes to the transmission of a monetary policy.

Monetary policy actions cause financial institutions such as banks to alter the volume of loans extended to economic agents. Hence, this influences the supply of credit on the one hand and also affects the demand for credit on the other. Therefore, whether it is from the supply side or demand side, tighter monetary policy is associated with weaker credit growth (Sheefeni and Ocran, 2013).

It is against this background that there is a need for a study aimed at establishing the relative importance and significance of the bank lending channel in Namibia.

1.2 Problem Statement

In most countries, particularly in developing economies, the major objective of monetary authorities is to create a suitable macroeconomic environment. The monetary transmission mechanisms that are effective depend on whether the monetary policies meet the set goals of the authorities (Ndekwe, 2013). According to Mishkin (1996), there are a number of channels through which monetary policy impacts on real economic variables. Among them are the interest rate, exchange rate and bank lending channels.

Change in monetary policy affects both demand and supply for loans. A contractionary monetary policy leads to a reduction in deposits which consequently exerts downward pressure on the amount of loanable funds (Goeltom, 2008). When the drop in the loanable funds cannot be offset by banks, there will be a reduction in bank loan supply. This is detrimental to firms and consumers who solely depend on bank financing, as they have to alter their investment and spending decisions. This implies that this disruption in the bank credit directly affects economic activity. In the Namibian context, there has been an increase in credit extension of which bank lending is the major source of financing, particularly in the form of bank loans. This raises questions due to the fact that excessive growth in credit can be inflationary. The Bank of Namibia put a cap on banks' setting of lending rates, which are set as the policy rate. As these policy initiatives take hold, it is imperative to evaluate the legitimacy of the bank lending channel under the monetary targeting framework and provide an opportunity for highlighting ways in which the frameworks adopted by

Bank of Namibia can be strengthened (Kalenga, 2001). Hence the need to investigate the importance of bank lending as a channel for monetary transmission in Namibia is critical.

Main Objective

- To investigate the impact of monetary policy on the real economy through the bank lending channel in Namibia.

1.4 Specific Objective

- To interrogate the impact of monetary policy on different components of the bank lending channel namely output growth (GDP), Bank Lending (BL), Inflation (P) and Interest Rate represented by Repo Rate (R).

1.5 Hypothetical Statement

H₀: The bank lending channel is not an effective channel of monetary policy

H₁: The bank lending channel is an effective channel of monetary policy

1.6 Significance of the Research

Although several authors have written on monetary transmission mechanisms, holistically, the series of studies might not give a true financial condition and monetary policy stance. For monetary policy to be successful, it is essential to have a broad understanding of the channels of monetary transmission mechanism and the associated lags. This research is expected to provide answers to some questions relating to the performance of monetary policy through the bank lending channel in Namibia and its effect on economic performance. Furthermore, it will provide insight on the effectiveness of this channel in transmitting monetary policy shocks. This will enable policy-makers (monetary authorities) to take appropriate policy measures in this regard.

1.7 Limitation of the Study

This research is to some point constrained by the unavailability of the long time series data. This is critical in the sense that it would enhance the robustness of the model estimates and the results thereof. In addition to this is the scope of the study which will only look at the causal relationship between the dependent variable and independent variables and not whether the nature of the relationship is long run or short run in nature. Since the Bank Lending Channel can be looked at from the demand and supply side, this study is limited to the Supply side because most of the literature's explanatory variables represent the Supply side.

1.8 Delimitation of the Study

The researcher made use of two decades' data for the period from 2009-2018. The researcher made use of four variables namely: output growth, bank lending, inflation and interest rate (represented by repo rate), which are mainly critical in the monetary policy transmission.

1.9 Ethics

The researcher will seek authorization for the use of figures and tables of other published sources. Furthermore, the researcher refrained from plagiarism and paraphrasing without authentic referencing. Schutt and Russell (2006) mentioned that in carrying out research the researcher must be guided by ethical considerations affecting the profession. The researcher will present the results as they are.

1.10 The Structure of the Study

The thesis comprises of five chapters. Chapter 1 presents the general introduction and the background information regarding the problem at hand. Chapter 2 reviews the related literature,

which provides in depth theoretical and empirical frameworks of the research. Chapter 3 discusses the methodology of the study, particularly the techniques employed. Chapter 4 focuses on the presentation of the results and analysis of data. Lastly, Chapter 5 summarises the findings as well as highlights the general conclusion and discusses some policy recommendations based on the findings. It also provides some key areas for future research on this research topic.

1.11 Chapter Summary

The chapter presented an overview of the study particularly highlighting the importance of monetary policy transmission through the bank lending channel. The chapter further looked at the problem statement which is addressed through specified objectives given limitations and delimitations of the study.

CHAPTER TWO: LITERATURE REVIEW

2. Introduction

This section presents the literature review for the monetary policy bank lending channel. The section is divided into two sections. Section 2.1 presents a discussion on the theoretical relationships and propositions of the bank lending channel. This includes discussions on the competing theoretical models and arguments. The section also discusses the three transmission mechanism channels to create an in depth understanding of their linkage and relevance to economic performances. Section 2.2 discusses the empirical literature. This is a mere quantification and empirical test/analysis of the theoretical propositions alluded to in the theoretical section. Section 2.3 highlights the various lessons drawn from both theoretical and empirical literature so as to contextualise the gaps this study intends to fill.

2.1 Theoretical Literature

The purpose of this section is to concretely examine the corpus of theory that has accumulated in regard to an issue, concept, theory, phenomena. The theoretical literature review helps establish what theories already exist, the relationships between them, to what degree the existing theories have been investigated, and to develop new hypotheses to be tested. This covers a selective list of competing theoretical models and arguments consisting of those in developed countries, developing countries and those specific to Namibia. The section specifically presents theoretical literature on the bank lending channel.

2.1.1 Transmission Mechanism channels in Monetary Policy

According to Sichei and Njenga (2012) the monetary transmission mechanism is usually defined by the impact of a change in the monetary policy instrument (e.g. the short-term interest rate or

base money) on intermediate variables (such as broad money or domestic credit) and final objectives (output and inflation). Three transmission mechanism channels are discussed below to provide an in-depth understanding of the monetary policy, their connections and relevance when it comes to vital economic decisions by policy makers. Hendry and Juselius (2001) in the context of Johansen cointegration, the authors suggest that the lag length ought to be set such that the Vector Auto Regression residuals are free of autocorrelation (the error term observation do not form a pattern), even if this implies longer lags than suggested by the information criteria.

The literature identifies five channels of monetary policy transmission. This paper will only provide a short summary review of the four channels. The main channels of monetary transmission are: Interest Rates Channel, Credit Channel, Exchange Rate Channel and Assets Price Channel.

2.1.2 Interest rate channel

The interest rate channel of transmission of monetary policy was clearly defined in Keynes' General Theory. The present value of capital and durable consumption goods is negatively related to the real interest rate (the marginal efficiency of capital function), (Huang, 2003). A lower real rate of interest implies a higher present value of existing durable (capital and consumption) goods and an increase in the ratio between the prices of existing stocks and the prices of newly-produced goods. According to Mishkin (2008), in a high-inflation economy, the interest rate channel loses strength because the relevant concept of the real rate of interest must be modified to take into account the high volatility of inflation. The relevant cost of capital concept must take into account the nominal interest rate minus the certainty equivalent of inflation. If inflation is very volatile, its certainty equivalent will exceed its expected value by a "volatility" premium (Pétersson, 2001). The author therefore stressed that a high real interest rate is not necessarily synonymous with tight

monetary policy if the volatility premium is similarly high. Pétersson (2001), further explained that when inflation goes down the interest rate channel is strengthened because low inflation usually also implies less volatile inflation. Hence the volatility premium decreases. A given real interest rate will produce much more monetary restraint when inflation is low and less volatile than when inflation is high and more volatile.

2.1.3 Credit Channel

It has been recognised in literature that monetary policy affects not only the interest rate but also the external finance premium, defined as the difference between the corporation's or household's cost of funds raised externally (by imperfectly collateralising borrowing, for example) and the opportunity cost of internal funds. This premium is very similar to the spread charged by banks between borrowing and lending rates and it is an important determinant of investment and spending decisions. As emphasised by Bernanke and Gertler (2002), the credit channel is not really an independent alternative to the traditional interest rate mechanism but rather an amplifying mechanism.

Two mechanisms have been considered in the literature on the credit channel: the balance-sheet (or net worth) mechanism and the bank lending mechanism. The balance-sheet mechanism is based on the well documented fact that a borrower with a stronger financial position pays a lower external finance premium.

The other mechanism of the credit channel, the bank lending mechanism, works through the conditions of supply of bank loans. A tightening of monetary policy reduces the supply of loans for small or medium-sized bank-dependent businesses, which are forced to search for new lenders

and to construct new credit relationships. These costly activities are likely to increase their external finance premium and hence to affect their spending decisions.

A very important observation when it comes to this channel is that expansionary monetary policy increases bank reserves and bank deposits, thus increasing the amount of loans available. This increase in loans will cause investment and consumer spending to rise. Schematically, the monetary policy effect is represented as:

$\downarrow \text{repo} \rightarrow \uparrow \text{bank deposits} \rightarrow \uparrow \text{bank loans} \rightarrow \uparrow I, \uparrow C \rightarrow \uparrow y$

2.1.4 The exchange rate channel

With regard to the continuing internationalisation of foreign trade, increased attention is being paid to the effect of monetary impulses on net exports through exchange rates, since a fall in domestic interest rates leads to an outflow of foreign capital and depreciation in the exchange rate. The commodity imports, which supports the growth of net exports and aggregate expenditure. Pétersson, (2001) emphasised that monetary policy tightening leads to an increase in the level of interest rates and appreciation in the exchange rate of the local currency under the floating exchange rate regime which affects the real economy in two ways. Firstly, through a price effect, that means the appreciation in exchange rate lowers the level of demand for domestic goods, which become more expensive than imported goods. This reduces the level of aggregate demand. Secondly, exchange rate variations have a significant balancing effect. In the case of domestic economic entities with foreign debt, exchange rate fluctuation has a substantial effect on the net wealth of companies. The author further indicates that economies with a high level of external debt perceive any appreciation in the exchange rate of the local currency as an improvement in the

balance sheets of companies, which may increase the level of domestic demand. Price and balance sheet effects may offset each other. In small open economies with a floating exchange rate regime, such a transmission channel may affect both aggregate demand and aggregate supply (Du Toit, 2007). Bernanke and Gertler (2000) concurred that a relaxation of monetary policy may lead to a depreciation in the exchange rate, rise in the price of imported goods, and an increase in the price of domestic products and goods without increasing the level of aggregate demand

2.1.5 Other asset price channels

Relative asset prices and real wealth are also channels for transmitting monetary effects through the economy. Two other asset prices, those on foreign exchange and equities, in addition to bond prices, act as channels for the transmission of monetary effects. According to Bank of Namibia (2008), when the Namibian real interest rates fall, deposits denominated in rand become less attractive than deposits denominated in foreign currencies and the rand depreciates. The lower value of the Namibian Dollar which is pegged to the Rand, makes foreign goods more expensive than domestic goods, causing a rise in net exports (NX) and hence in aggregate output. The representation illustration of the exchange rate channel is:

$\downarrow \text{repo} \rightarrow \downarrow \text{interest rates} \rightarrow \downarrow \text{ER} \rightarrow \uparrow \text{NX} \rightarrow \uparrow \text{Y}$

A further important consequence of the depreciation of the rand is that it directly increases the cost of imported goods and therefore has a negative effect on the domestic price level, and hence on inflation. Monetary policy can also affect the economy through its effect on the valuation of equities. As monetary policy is relaxed, the public finds it has more money to spend and one potential place for spending this money is the stock market. The higher demand for stocks leads to

a subsequent rise in their prices. Combining higher equity prices with higher investment spending leads to the following schematic transmission of monetary policy:

$\downarrow \text{repo} \rightarrow \uparrow \text{equity prices} \rightarrow \uparrow I \rightarrow \uparrow y$

2.1.6 Conditions for bank lending channel to operate

1. Monetary policy must affect banks' credit supply. When central banks conduct an open market sale to reduce aggregate demand this practice drains bank reserves from the system. Reducing of bank reserves causes bank liabilities (deposits) to reduce, it must also reduce bank assets. Assuming that banks treat the loans and securities that make up their portfolios as imperfect substitutes, the loss of deposits will induce them to try to reduce both categories of assets (Bernanke, 1993). Therefore, loans and securities have to be imperfect substitutes in banks' balance sheets so that monetary policies may affect banks' loan supply.
2. There must be borrowers depending on bank loans. Banks play a special role in the financial system, because they are exceptionally appropriate to overcome informational problems in the credit market. Due to this special role of the banks, some borrowers will not be able to reach credit markets unless they receive loan from the banks (Mishkin, 2010). Therefore, the reduction of credit volume created by banking system has to have significant macroeconomic results (Bernanke, 1993; Claus and Grimes, 2003). In order for this condition to be hold, there must not be a relation of perfect substitutes between bank loan and other financing means in firms' balance sheets. In other words, firms should not be indifferent between issuing securities and receiving loans to finance their investment project.

The amount of funds in the financial structure of firms and their shares of bank loans in the overall external financing determines the importance of banks loans for firms (Juks, 2004). The amount

of bank dependent borrowers is associated with the development level of financial markets of the countries. Namely, the countries where capital markets are less developed and the direct access to these markets is poor have more bank dependent borrowers (Cecchetti, 1999). An important result that can be obtained from credit view is that the monetary policy has a larger effect on the expenditures of small firms which are more bank dependent, rather than the expenditures of large firms which can directly access to capital markets (Mishkin, 2010).

2.1.7 Bank Lending and Credit Market Imperfections

The bank lending channel is founded on the basis that banks play a special role in the financial system because they are appropriate to deal with asymmetric information problems in credit markets. Bayangos (2010) indicated that the bank lending channel is based upon two critical assumptions. First, bank loans and other non-bank assets such as commercial paper are imperfect substitutes; this is because of imperfect information in credit markets. Mostly small firms are by large dependent on bank loans. This is due to the fact that these firms find it very difficult to acquire funds through other means such as issuing securities or bonds due to high screening and monitoring costs (Mies and Tapia, 2003).

The issue of credit market imperfection resulted from the ambiguity in the literature regarding the impact of monetary policy on expenditure on long-standing assets. This gave rise to the view that there is a presence of asymmetric information in financial markets. Mishkin (1996) indicates that information problems are related to the costly verification and enforcement of financial contracts. It is in this view that the bank lending channel is alluded to as a channel of monetary transmission that arise as a result of information problems in credit markets. There is enormous literature on the credit channel, pioneered by Bernanke and Gertler (1995), Cecchetti (1995) and Hubbard (1995).

According to Fisher (1998), the transmission of monetary shocks can be influenced in two ways by imperfect credit markets. One pay attention to the role of net-worth in determining the premium which borrowers pay for external finance. The other view focus on the ability of monetary policy to influence the supply of loanable funds at commercial banks. To sum it up, the two views are then referred to as bank lending channel of the monetary transmission mechanism.

Holtemoller (1999) stated that the function of the credit market to support the efficient allocation of savings and investment is essential. However, due to credit market imperfections such as incomplete and asymmetric information as well as transaction costs resulted in the birth of financial intermediaries. The informational problems on credit markets can be divided into adverse selection, moral hazard, monitoring costs (or costly state verification), and agency costs. In the presence of these informational problems, external financing option becomes more expensive for a firm relative to internal financing using retained earnings. The cost differential between external financing and internal financing is referred to as external finance premium (EFP).

de Bondt (2000) contends that informational problems in the form of credit market imperfections can be mitigated by the existence of financial intermediaries coupled with available technology as well as economies of scale or scope. Echoing the same sentiments are Bhattacharya and Thakor (1993), who argued that financial intermediaries performs two major functions: (i) matching borrowers and lenders without changing the characteristics of the credit contract (brokerage) and (ii) transforming risk and/or maturity (qualitative asset transformation). Hence, financial intermediaries play an important role for the efficient allocation of resources.

2.1.8 Demand for and Supply of Loans

The second assumption on which the bank lending channel is founded state that through change in monetary policy, the central bank has the ability to constraint the supply of bank loans. For instance, a monetary policy contraction leads to a reduction in bank reserve money and quantity of loans, hence bringing about a fall in spending by bank-dependent customers (Sheefeni, 2013). Bayangos (2010) also share similar sentiments by indicating that most studies have shown that bank loans decline after a monetary policy shock.

However, it remains unclear whether the drop is driven by the loan supply or loan demand effects. This is restrained to the problem of identification. In relation to the above, the operation through the bank lending channel are that, a tightening of monetary policy is usually assumed to result in a decrease in bank reserves and to drain bank deposits from the banking system. Thus, banks are forced to rearrange their portfolios by reducing their loan supply, given the imperfect substitutability between loans and other assets (Ludke, 2000). In addition, de Mello and Pisu (2009) indicate that the supply of loans by the banks depends on the extent which monetary shocks are employed. The monetary policy plays a role in reestablishing equilibrium in the credit market by affecting the borrowing rate faced by banks to raise non-deposit funds.

De Haan (2001) supports the preceding argument that the role of banks in the monetary transmission process focuses on the reaction of the loan (and deposit) supply to monetary shocks. The literature on the bank-lending channel has suggested several bank characteristics that determine how susceptible banks are to the lending channel:

- (i) The size of a bank: Small banks encounter more asymmetric information problems on the capital market than large banks and therefore may find it more difficult to raise uninsured, *i.e.* non-deposit, funds in response to monetary tightening (Kashyap and Stein, 1995).
- (ii) The degree of liquidity: liquid banks can draw on their reserves of cash and securities to protect their loan portfolio, while this is less possible for illiquid banks (Kashyap and Stein, 2000).
- (iii) The degree of capitalization: poorly capitalized banks have less access to non-deposit funds and are therefore forced to cut their loan supply by more than well-capitalized banks (Peek and Rosengren, 1995).

According to (Bernanke and Gertler, 1995), the balance sheet of firms provides another channel through which monetary policy may affect real economic activity. More specifically, a tightening of monetary through credit channels which reduces the firm's cash flow and thus causes the balance sheets to deteriorate. Firms that have no access to credit markets may need to cut production and employment.

Credit channel of monetary transmission mechanism constitutes two sub-channels: the bank lending channel and the balance sheet (Bernanke & Gertler, 1995; Cecchetti, 1995; and Hubbard, 1995). Commercial banks play a crucial role in most financial systems by solving the problem of asymmetric information in the financial markets. With the bank lending channel, an expansionary monetary policy increases bank reserves and bank deposits (B_d) leading to a rise in the quantity of bank loans (B_L) to borrowers. As a result, investment (I) expenditure rises and hence, an increase in output (Y). Schematically, the expansionary policy effect is illustrated as:

$$M \uparrow \rightarrow B_d \uparrow \rightarrow B_L \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

The balance sheet channel came about as a result of information asymmetry problems in the credit markets. Monetary policy can affect the balance sheet of firms. Expansionary monetary policy that is increase in the stock of money (M) may cause a rise in equity prices (P_e) which increase the net worth of firms leading (L) to higher investment (I) spending and a rise in aggregate demand (AD) due to the fall in adverse selection (AS) and moral hazard (MH) problems. The schematic illustration is shown as:

$$M \uparrow \rightarrow P_e \uparrow \rightarrow AS \downarrow \text{ and } MH \downarrow \rightarrow L \uparrow \rightarrow I \uparrow \rightarrow AD \uparrow$$

The debate regarding the channels has not only taken place from a theoretical point of view but they have also influenced empirical studies as well. To sum up, monetary policy contraction leads to a reduction in the supply of bank loans and this can in turn affects the real economic activity.

2.2 Empirical Literature

There are various studies that have empirically looked at monetary policy transmission mechanisms, in particular the case of bank lending channel. This section highlights a selective list of empirical studies comprised of those in developed countries, developing countries and Namibia specific.

2.2.1 Empirical Studies from Developed Countries

Bondt (1998) who investigates the credit channels in some European countries focussing on the role of bank specific factors. The author used a panel data covering the period 1990-1995. The study uses short-term interest rates and a monetary conditions index as measures of monetary policy stance. Empirical results provide evidence for the existence of the credit channel in Europe. Explicitly, the bank-lending channel is found to be strong in German, Belgium and Netherlands,

while the balance sheet channel is strong in German and Italy. In the UK, the BLC is non-existent or dominated by loan and deposit demand factors of bank customers. Similar technique was used by Ignacio and Martinez-Pages (2001) to test the presence of the bank-lending channel in Spain using a panel data for the period 1991 to 1998. Their empirical results put forward that there is no evidence for the existence of the bank-lending channel in Spain.

Ludke (2000) investigated the credit channel in Germany and the United Kingdom using monthly data for the period 1989:2 to 1998:12. In this study, an unrestricted vector auto regression model (VAR) was used. The results show that the differences in the transmission effects are relatively small.

In the Netherlands, De Haan (2001) study looked at the lending channel using individual bank data for the period 1990: Q4 to 1997: Q4. Various techniques such as ordinary least squares (OLS) and generalized method of moments were used for analysis. The results from the study revealed that a lending channel is operative. However, it is only operative for unsecured and not for secured lending. Moreover, effects of monetary tightening on unsecured lending are more negative for smaller, less liquid and less capitalized banks, in line with the lending channel theory.

Loupas, Savignac and Sevestre (2002) examine the possible existence of a bank lending channel in France during the period 1993 to 2000. The authors used the three-month interbank rate as a measure of monetary policy. They separate banks according to bank size, liquidity and capitalization. The main result is that illiquid banks are more sensitive to a tightening of monetary policy. They find that bank size and capitalization have no significant impact on bank lending.

Conflicting to previous studies that use bank-level data, Huang (2003) investigates the existence of a Bank Lending Channel in the United Kingdom using balance sheet data for a panel of United Kingdom-listed firms over the period 1975 to 1999. The author uses selected bank base rates as an indicator of changes in monetary policy. The key result from this study is that a higher interest rate brings about more bank lending to listed companies, however, this effect reduces if monetary policy becomes tighter enough to enforce severe constraints on bank loan lending mechanism.

In Greece, Brissimis, Kamberoglou, and Simigiannis (2003) empirically analyses the role that bank lending has in monetary policy transmission using bank level data. They used two methods: one in the essence of Kashyap-Stein (1995) employing a reduced form equation linking monetary policy and loans while the second approach follows that of Bernanke-Blinder. The authors' main results show that the Kashyap-Stein model does not produce conclusive results while the Bernanke-Blinder produces results that are more satisfactory. Generally, they find the existence of a Bank Lending Channel. In addition, bank-specific characteristics were found to systematically shift the loan supply function. The results showed that large banks could to a certain extent; shield their loan portfolio from monetary policy changes. Similar results hold for the healthy banks in Greece.

Opiela (2007) identifies the Bank Lending Channel using data on the banking system in Poland during the period when deposit guarantees were differentially applied (1995 to 1999) and the post-1999 period. The author finds that banks with partial guarantees have a stronger loan response to monetary policy than banks with full deposit guarantee.

Another country specific study by Ignacio and Martinez-Pages (2001) tests the existence of the bank-lending channel in Spain using a panel data for the period 1991 to 1998. Their empirical results suggest that there is no evidence for the existence of the bank-lending channel in Spain.

Similarly, in Poland, Hosing (2013) studied the bank lending channel for the period 2004: Q1 to 2013: Q1 based on a simultaneous equation model consisting of demand for and supply of bank loans. The three-stage least squares methodology is employed in this work. The results reveal the presence of the bank lending channel. Moreover, expansionary monetary policy through a lower money market rate or open market purchase of government bonds to increase bank reserves/deposits would increase bank loan supply.

Odabaşioğlu and Aydın (2013) investigated the effectiveness of the monetary transmission channels in Central and Eastern European (MDA) transition economies. The study used data from 1995:01-2012:12 periods on macroeconomic variables. The following techniques were used. Firstly, the Vector Auto Regression Analysis (VAR) was carried out in order to determine the short-term dynamics of the effects of the transmission channels on macroeconomic variables. Secondly, the long-term dynamics of the effects of transmission channels on macroeconomic variables were searched via autoregressive distributed lag (ARDL) analysis. The study concluded that financial development and exchange rate were the most efficient channels on economic variables in most of the said economies.

Uslu and Karahan (2016) analysis the efficiency of bank lending channel in Turkey. In the analysis of monthly data within the period 2002:1-2014:12, the authors made use of Vector Auto

Regression model. The empirical results of the study show that monetary policy through the bank lending channel play an important role on the real economy in the short term. In this study it is confirmed that functioning of a bank lending channel for Turkey's economy.

Mahathanaseth and Tauer (2019) investigates the strength of the bank lending channel in the transmission of monetary policy in Thailand. The author captured bank behavior using quarterly balance sheet data for ten commercial banks of different sizes for the period 2007 to 2016. The author estimated the bank supply and demand equations based on the flexible form profit function. The results were used to derive time-dependent supply and demand elasticities which ten combined with estimates of pass-through from the policy rate to retail rates to stimulate the dynamic impact of monetary tightening on bank portfolio allocations. The observations were that due to pass-through differentials among retail interest rates, an increase in the policy rate is shown to raise the cost of loan production relative to the return on loans, thereby motivating banks to contract their lending to businesses and households. The smaller banks showed greater degree of loan contraction than larger banks because larger banks are better able to fund continued lending through debt issuance. Thailand economy depends heavily on bank loans; the findings therefore suggests that the bank lending channel is an important mechanism in the transmission of monetary policy in Thailand.

2.2.2 Empirical Studies from Developing Countries

Gupta (2004) investigated the presence and significance of bank lending channel of the monetary policy transmission in India and Pakistan. The study employed a Structural Vector Auto Regression (SVAR) approach on quarterly data for the period 1957: Q1 to 2004: Q1. The results reveal the presence of a bank lending channel in these countries. Changes in the monetary policy

instruments affect the credit variable (private sector claims) which in turn transmits the shocks to the real side of the economy, i.e. output and prices. The output returns back to initial level in long run, while the effect of monetary policy changes on prices are persistent.

Bank Lending Channel in South Africa

Sichei (2005) investigates the bank-lending channel (BLC) of monetary policy in South Africa using quarterly bank-level data for the period 2000Q1-2004Q4. Capital adequacy and bank size are used as indicators for information problems faced by banks when they look for external finance. The study utilised dynamic panel estimation methods the study shows that Bank Lending Channel operates in South Africa. The finding however has some policy implications. Firstly, there is need to coordinate monetary policy with financial innovations and prudential banking regulations. Secondly, the overall effects of monetary policy pursued by the South African Reserve Bank cannot be completely characterized by interest rates only.

Bank Lending Channel in Malaysia

Goh, Chong and Yong (2007) examined the relevance of bank lending channel for the transmission process of monetary policy in Malaysia. An autoregressive-distributed lag (ARDL) model was employed on monthly data for the period 1990:01 to 2004:03. The results show that deposits tend to fall following contractionary monetary policy shocks.

Bank Lending Channel in Sierra Leone

Ogunkula and Tarawalie (2008) utilised a vector error-correction model to analyse monetary transmission in Sierra Leone they used data for over the period from 1990 to 2006, during which the exchange rate was flexible and domestic interest rates were market-determined. They employed a recursive identification scheme with the monetary policy variable ordered last. Unlike most other investigators focusing on sub-Saharan African countries, they found that monetary

policy had effects on real GDP and bank credit in the directions predicted by the bank credit channel. However, their study also suffered from several flaws.

Benkovskis (2008) examined bank lending channel of monetary policy in Latvia. The author used quarterly data for the period from the second quarter of 1998 until the fourth quarter of 2006. The study employed the Generalised Method of Moments (GMM) in order to account for the autoregressive nature of the model and for the possible dispersion of bank characteristics. Empirical analysis shows that some banks in Latvia have statistically significant negative reaction to a domestic monetary shock; however, the weighted average reaction of the total lats loan growth is not statistically significant. The bank lending channel is limited only for the supply of lats loans, which dramatically reduces the importance of this channel.

Lungu (2008) examined monetary transmission in Southern Africa, using a seven-variable VAR containing industrial production, prices, M2, the monetary base, the central bank policy rate, the supply of bank loans, and bank lending and deposit rates. In contrast with the studies carried out by Buigut (2009) and Saxegaard (2006). The author identified monetary shocks using an a theoretic Choleski decomposition with the central bank policy rate ordered first, indicating that monetary policy does not react contemporaneously to any of the other variables in the system. The author found mixed evidence for the bank lending channel in Botswana, Malawi, Namibia, and Zambia. The general pattern was that while bank lending and deposit rates responded to innovations in the policy rate in the expected direction, such innovations seemed to have little effect on total bank lending, on output, or on prices.

de Mello and Pisu (2009) test the present of the bank lending channel to explain the monetary policy transmission in Brazil. A Vector error-correction model was utilized on monthly data for the period 1995:12 to 2008:6. The results show that loan supply is negatively related to the interbank deposit certificate rate in the long term, which confirm the existence of a lending channel for monetary transmission.

Sun, Gan and Hu (2010) test the existence of the bank lending channel to explain the monetary policy transmission in China for the period 1997: Q1 to 2008: Q4. In this study the vector error correction model (VECM) was used purposely to disentangle the bank loan supply and bank loan demand effects of monetary policy movement. The result shows that in the identified loan supply equation, loan supply is negatively related to required reserve ratios and official one-year lending rate in the long term. This confirms the existence of a lending channel for monetary transmission in China.

Sichei and Njenga (2012) investigates the Bank Lending Channel in Kenya using bank level annual panel data covering 2001 to 2008. The main finding of this study was that the BLC exists in Kenya based on bank capitalisation and liquidity. Specifically, they find that banks with less liquid balance sheets and low total capital to risk-weighted asset ratios are hit most by monetary policy.

Mishi and Tsegaye (2012) empirically investigate the role played by private commercial banks in South Africa in transmitting the impulses of monetary policy shocks to the rest of the economy, focusing on the bank-lending channel. In their econometric approach, they use the dynamic panel data methods using the repo-rate as the monetary policy indicator. Their results indicate the presence of the Bank Lending Channel in South Africa with size of the playing a pivotal role.

Specifically, they find that the size of the bank shifts the loan supply curve to the right but size does not affect the response of commercial banks to monetary policy changes.

In the Philippines, Aban (2013) study empirically tested the presence of a bank lending channel of monetary policy for the period 2008 to 2011. Panel ordinary least squares method was employed on the quarterly data to check the relationship between loan growth and monetary policy. The results show that loan growth of small banks is sensitive to movements in monetary policy, thus providing evidence for a bank lending channel in the Philippines. Increase in policy rates result in a decrease in loan supply of small banks. Opolot (2013) examines the relevance of the bank-lending channel in monetary policy transmission of Uganda using a bank-level data for the period Q1 2001 to Q4 2012. Using the Dynamic Panel Data methods in the spirit of Arellano and Bondt (1991), the results indicate the existence of a bank-lending channel of monetary policy transmission in Uganda.

Ndekwa (2013) analysed the monetary policy transmission mechanisms to the real economy in Nigeria by examining the process by which the interest rate policy of the Central Bank of Nigeria affected the structure of interest rates, credit, aggregate demand and output production and hence, changes in inflation rate. The study found that the credit channel in the financial market for credit supply and accessibility to the private sector provided the effect of a linchpin in the process by which monetary policy transmitted to the real economy. In the same vein, the researcher used both quarterly and annual data from 1981 to 2006. The study adopted vector auto regression with dynamic logarithmic form and the ordinary least squares (OLS) methods.

Olorunsola, Bada, Basseey, and Dzaan (2014) assesses the existence of the bank lending channel of monetary policy transmission in Nigeria by examining whether changes in the policy feeds to

the balance sheets of commercial banks. Using quarterly data for the period 2002 to 2012, the study uses ordinary least squares (OLS) and vector auto regression (VAR) approaches to investigate the linkages between policy, commercial banks and real sector variables. Their results reveal the existence of balance sheet channel in Nigeria with a significance of the relationship between balance sheets variables and output as well as prices.

2.2.3 Empirical Studies from Namibia

Sheefeni and Ocran (2013)'s paper investigates the presence and significance of the credit channel of the monetary policy transmission in Namibia over the quarterly 1993: Q1 - 2011: Q4. The empirical analysis was conducted using innovation accounting tools such as impulse response functions and variance decompositions obtained from a structural vector autoregressive model (SVAR). The results of econometric analysis support the presence of a significant bank lending channel in Namibia, that is, changes in the monetary policy instruments affect the credit variable which in turn transmits the shocks to output and prices. The study established that the credit channel serves as a good vehicle to transmit shocks innovated by monetary policy actions to the real side of the economy.

Uanguta and Ikhide (2002) examined the interest rate and credit channels of monetary transmission in the Namibian economy using a structural VAR model. They used monthly data from 1990-1999, and their variables include private investment, credit to the private sector, money supply, consumer price index and lending rate. Their findings show that a tightening of monetary policy as evidenced by an increase in the repo or bank rate causes lending rates to increase in the domestic economy causing a decrease in private investment and hence a decrease in output. Additionally, to the results above, their finding was also that changes in the South African Reserve Bank's policy

rate is transmitted to lending rates in Namibia, as well as to private investment. Both approaches, therefore, were taken to support the effectiveness of the bank lending channel in Namibia. SARB sets its repo rate with reference to the behavior of macroeconomic variables in Namibia.

2.3 Lessons

There are lessons to be learnt from these studies. First, the bank lending channel appears to be important. However, there seems to be variation in terms of its effectiveness as in some cases, it is significant and ineffective in other cases it is not. It is worth mentioning that various literature has shown the effectiveness of bank lending channel in developed countries compared to developing countries. Secondly, there is a variation in terms of the techniques employed ranging from vector error correction modes, generalized method of moments, error correction models and autoregression distributed models though the VAR technique appear to be more pre-dominant. In terms of Namibia's literature in this regard the only study that comes close to this study is that of Sheefeni and Ocran (2013). The current study differs from that of Sheefeni and Ocran (2013) in the sense that, it uses data for a period of ten years from (2009Q1-2018Q4), additionally the study uses more recent data adding an additional Six years to address the time-gap. This study attempts to fill this gap.

2.4 Chapter Summary

This chapter looked at various theories from scholars by unpacking various channels and how they affect the real economies. The chapter further presented different empirical literatures from developed and developing countries. Overall, the author could conclude that the transmission of monetary policy through bank lending channel is effective in developed countries compared to developing countries. This could be because of less risk in credit extensions to businesses and household

CHAPTER THREE: METHODOLOGY OF THE RESEARCH

3.1 Introduction

This chapter presents the data sources, different types of estimation procedures, various equation models and approaches to be used in carrying out the study.

3.2 Research Methods

The study is of quantitative in nature due to the fact that already existing secondary data was obtained from Bank of Namibia and International Monetary Fund from 2009Q1 to 2018Q4 and sophisticated data analysis software were used.

3.3 Research Design

Based on the empirical literature, this study will follow Sun, Gan and Hu (2010) and Hosing (2013) to test the existence of the bank lending channel to explain the monetary policy transmission in Namibia, and this is informed by the complicated nature of the economic relationships between the variables, which cannot be explained by a single equation model. Moreover, the majority of empirical studies have predominantly used the VAR approach in analysing monetary policy transmission mechanisms. Hence, that justifies the use of this approach.

3.3 Data Sources and Estimation Pocerure

This study utilised quarterly time-series data for the period 2009Q1-2018Q4. The data was obtained from various sources namely: *National Accounts* (Republic of Namibia), Bank of Namibia's *Quarterly Bulletins and Annual Reports* as well as from the International Monetary Fund's *International Financial Statistics*. The data for the following variables was obtained by the

author namely: output, general prices, bank loans to the private sector and interest rate from the International Monetary Fund's *International Financial Statistics*..

The estimation procedure will follow the following sequence; As a standard, the initial step is to test for non-stationary (unit root) of time series in order to establish the univariate characteristics of data and the order of integration. To investigate the non-stationarity of the series, the Augmented Dickey Fuller (ADF) test and the Phillips-Perrons (PP) test were applied. However, the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test is not used in this study. Usually, the Augmented Dickey Fuller statistic tests the null hypothesis of the existence of unit roots, against the alternative hypothesis of non-existence of unit roots (Pindyck & Rubinfeld, 1991; Gujarati, 1995; 2003). Thereafter, a Granger causality test is performed.

Vector Auto Regression is also considered as a means of conducting causality tests within the framework of specifically, Granger causality tests. This test is used to determine whether one-time series is good for forecasting the other. This causality test really implies a correlation between the current value of one variable and the past values of others; it does not mean changes in one variable cause changes in another. If there are two series Y_t & X_t , then it is said that X_t doesn't granger cause Y_t if all lagged coefficients for X_t are zero, that is:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \dots + \alpha_p Y_{t-p} + \beta_1 X_{t-1} + \dots + \beta_p X_{t-p} + \varepsilon_t \quad \dots 1$$

Then $\beta_1 = \beta_2 = \dots = \beta_p = 0$, that is lagged of X_t has no effect on Y_t . It is possible to have causality running from variable X to Y , but not Y to X ; from Y to X , but not X to Y and from both Y to X and X to Y , although in this case interpretation of the relationship is difficult. The 'Granger causality' test can also be used as a test for whether a variable is exogenous. That is if no variables

in a model affect a particular variable it can be viewed as exogenous. To determine which variable causes the other, pair-wise granger causality tests are used. But since this test is affected by the number of lags, before running this test it is necessary to determine the number of lags. There are many criteria used to indicate the number of lags. These criteria are Hannan-Quinn (HQ), Schwarz information criterion (SC), Akaike Information Criterion (AIC), Final prediction error (FPE) and Likelihood Ratio (LR). After determining the number of lags, it is possible to run a pair wise granger causality test so long VAR satisfies the stability condition.

The next step involves co-integration test that is if two or more series have long-run equilibrium. The co-integration test can be applied in several ways, according to the nature of the equation that is tested. However, for this study the Johansen Approach is applied to determine the existence of the long run relationship among variables since this study estimates a multivariate model. The Johansen procedure uses two tests to determine the number of co-integration vectors: The Trace test and the Maximum Eigenvalue test. Trace statistics investigate the null hypothesis of r co-integrating relations against the alternative of n co-integrating relations, where n is the number of variables in the system for $r = 0, 1, 2 \dots n-1$. Its equation is computed according to the following formula:

$$LR_{tr}(r/n) = -T * \sum_{i=r+1}^n \log(1 - \hat{\lambda}_i) \quad \dots 2$$

The Maximum Eigenvalue statistic tests the null hypothesis of r cointegrating relations against the alternative of $r+1$ cointegrating relations for $r = 0, 1, 2 \dots n-1$. These test statistics are computed as:

$$LR_{max}(r/n+1) = -T * \log(1 - \hat{\lambda}) \quad \dots 3$$

Where λ_i is the Maximum Eigenvalue and T is the sample size.

In cases where Trace and Maximum Eigenvalue statistics may yield different results, the results of trace test are preferred. Prior to applying the Johansen test, the number of lags must be determined as suggested by the five criteria stated earlier. If the test for co-integration shows that there is cointegration among the variables found among the variables, the adjustment of the short-run to the long-run equilibrium is obtained through the vector error correction model (VECM) and if no cointegration found then a VAR model specification is estimated. Whether from VAR or VECM the impulse response function (IRF) and forecast error variance decompositions (FEVD) are derived. IRF traces the response of the endogenous variables to one standard deviation shock or change to one of the disturbance terms in the system. A shock to a variable is transmitted to all of the endogenous variables through the dynamic structure of the VAR. FEVD examines the effects of shocks to the dependent variables. It determines how much of the forecast error variance for any variable in a system, is explained by innovations to each explanatory variable, over a series of time horizons.

3.4 Model Specification

VAR is the reduced form of a general dynamic model as presented in equation 1 below. The reparameterization of Equation 1 leads to a reduced-form relationship represented by Equation 2.

$$\Gamma Y_t = B(L)Y_t + e_t \quad \dots (5)$$

$$Y_t = \Gamma^{-1}B(L)Y_t + \Gamma^{-1}e_t \quad \text{or} \quad Y_t = B^*(L)Y_t + \mu_t \quad \dots (6)$$

where Y_t is a $(n \times 1)$ vector of endogenous variables and $B(L)$ denotes a polynomial in the lag operator. Γ and B are parameters. e_t is the residual of the model.

It can be inferred from the Equations 1 and 2 that

$$B^* = \Gamma^{-1}B \quad \dots (7)$$

$$\mu_t = \Gamma^{-1}e_t \quad \dots (8)$$

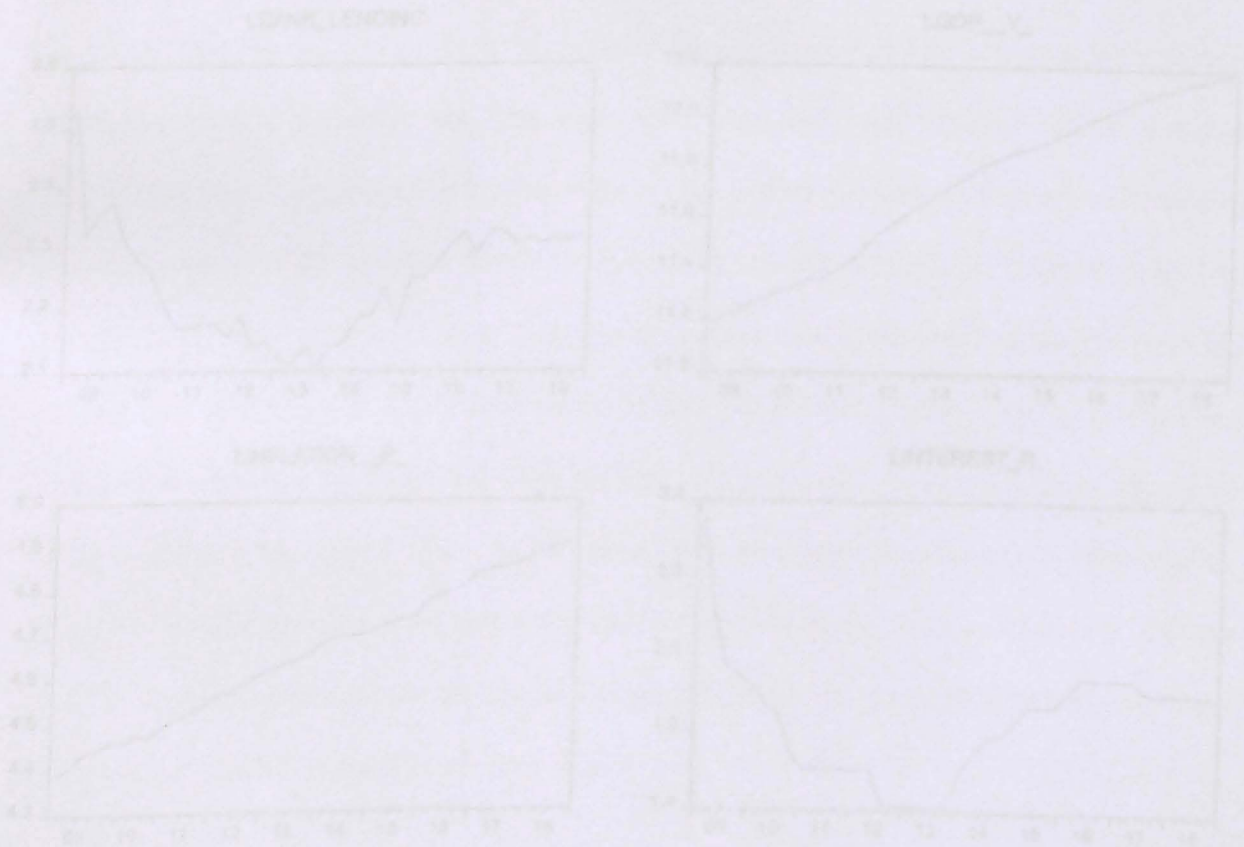
Equation 4 is the core representation of the structural vector autoregression model whereby the reduced-form disturbance μ is related to the underlying structural shocks. e_t the identification of Γ and B are required to obtain the structural parameter B^* . This study uses the four-variable VAR.

The vector of endogenous variables of the bank lending model includes:

$$Y_t' = [\Delta y_t, \Delta p_t, \Delta bl_t, \Delta r_t] \quad \dots (9)$$

With Δy_t denoting output growth, Δp_t the rate of inflation, Δbl_t is the bank loan to the private sector and Δr_t is the short-term interest rate, which is represented by the repo rate.

Figure 2.1 Diagnostic Representation



Source: author's compilation and values obtained from B-views

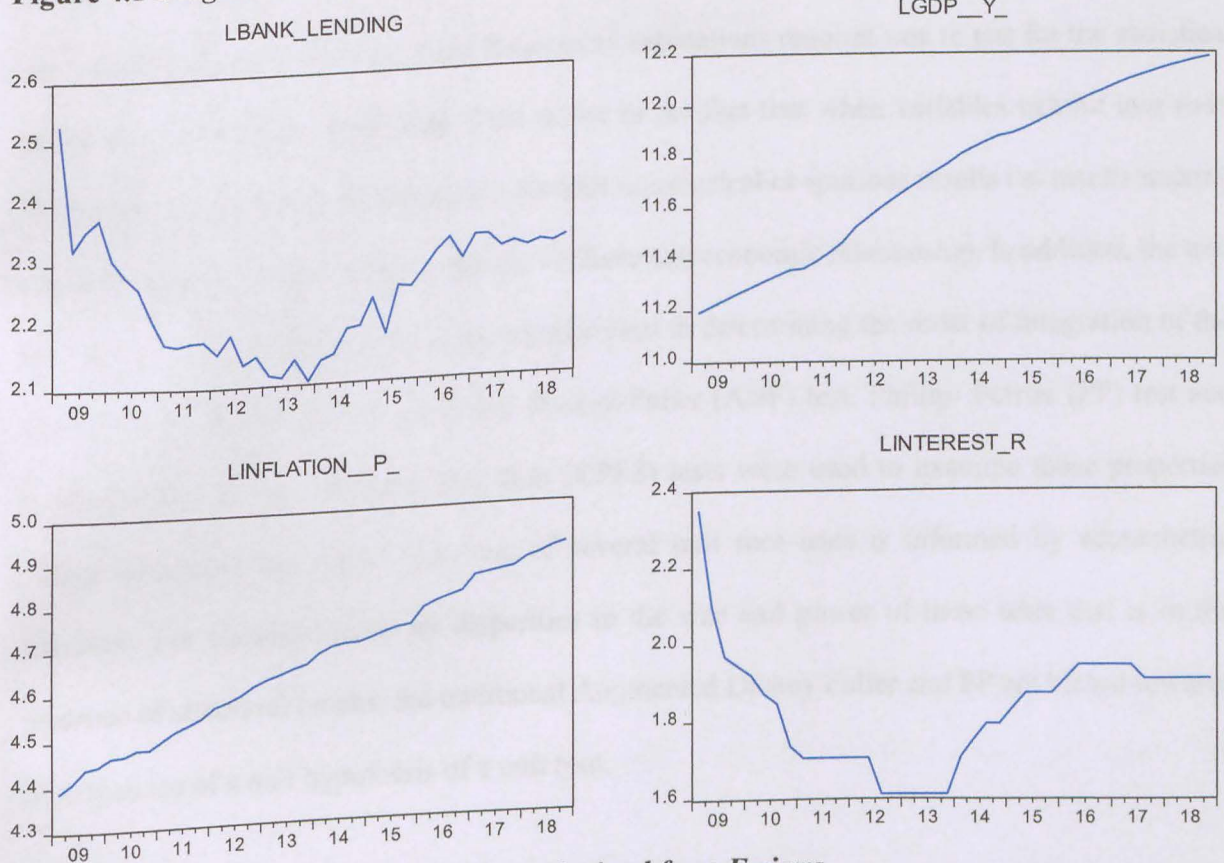
CHAPTER FOUR: EMPIRICAL FINDINGS AND ANALYSIS

4.1 Introduction

This chapter focuses on the empirical estimations and analysis. The chapter is divided into three sections. Section 4.2 presents a discussion on the detailed estimation of the vector autoregression model. In presenting the results for the VAR model, this study will adopt the following sequence; VAR cointegration tests, generalised impulse response function (GIRF) and forecast error variance (FEVD). Section 4.3 presents the discussion on the detailed estimation for the autoregressive distributed lag model. Lastly, section 4.4 will conclude the section.

In order to understand the behavior of the variables over the period of ten years (2009-2018) which are used in this study, a simple diagnostic representation is performed.

Figure 4.1 Diagnostic Representation



Source: author's compilation and values obtained from E views

Figure 4.1 shows a graphical diagnostic representation of the behaviour of the economic variables used in this study. In line with the model specifications are: log bank lending (BL), log rate of log output growth (Y), log repo rate (R) and inflation (P). The variables Y and P show an upward movement over time while BL shows an upward swing and dramatic downward swing at the same time, more of wavering motion over time. R (interest rate) shows a drastic downward swing before picking up an upward movement and thereafter experienced a constant movement. The continuous movement of inflation and output growth can be attributed to the increase in prices of goods and services which resulted as an aftermath from the 2008 global economic recession.

4.2 Detailed estimations: Vector Auto-regression Estimations

4.2.1 Unit Root

The initial step prior to Vector Auto Regression estimations requires one to test for the statistical properties for the time series data. This is due to the fact that when variables exhibit unit root, Vector Auto Regression estimates may produce nonsensical or spurious results i.e. results making statistical sense even for variables that do not have any economic relationship. In addition, the unit root test (stationarity test) is a testing strategy used in determining the order of integration of the variables. In this study the Augmented Dickey-Fuller (ADF) test, Phillip- Perron (PP) test and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) tests were used to examine these properties before estimating the model. The use of several unit root tests is informed by econometric literature. For instance, there are disparities in the size and power of these tests that is in the presence of structural breaks, the traditional Augmented Dickey Fuller and PP are biased towards non rejection of a null hypothesis of a unit root.

Table 4.1: Unit root tests: ADF and PP in levels and first differences

Variable	Model Specification	ADF	PP	ADF	PP	Order of integration
		Levels	Levels	First Difference	First Difference	
lnBL _t	Intercept	-1.271	-3.349*	-10.720**	-9.345**	1
	Intercept and trend	-2.235	-4.182*	-11.681**	-11.046**	1
lnY _t	Intercept	-1.914	-1.558	-1.549*	-2.605**	1
	Intercept and trend	-0.766	-0.222	-2.988**	-2.458**	1
lnP _t	Intercept	-0.777	-1.463	-6.883**	-8.797**	1
	Intercept and trend	-3.278	-3.339**	-6.821**	-8.734**	1
lnR _t	Intercept	-4.433**	-3.651**	-5.944**	-6.140**	1
	Intercept and trend	-2.396	-5.296**	-5.756**	-5.757**	1

*Source: author's compilation and values obtained from E views, * and ** denotes rejection of the null hypothesis at 10 percent and 5 percent respectively*

Table 4.1 presents the results of the unit root tests for the series under investigation. The results show that the bank lending, repo rate and rate of inflation variables are all stationary when tested in levels with the exception of output growth (lnY). It is worth mentioning that interest rate (R) is the only variable which is stationary after running the Augmented Dickey Fuller test in levels. Upon establishing that some series are not stationary in levels, the next step was to difference them once in order to observe their reaction. Upon taking the first difference, then it resulted in all variables (bank lending, repo rate and inflation, including output growth) becoming stationary. This implies that the variables are of I (1) processes which is “Order of integration” being a summary statistic used to describe a unit root process in time series analysis. Specifically, it tells you the minimum number of differences needed to get a stationary series. Therefore, the

hypothesis of the presence of the unit root was rejected against this background, hence, VAR estimates will not produce nonsensical or spurious results.

Before attempting further tests, it is essential to look at the information criteria which are the initial measures that can be adopted when selecting the appropriate lag length in a time series. However, we can get conflicting conclusions regarding the lag length when these criteria are used. One should use sufficiently large number of lags when estimating a VAR model, of course depending on the number of observations. It is important to test if the same model can be estimated with fewer lags on the variables included. Testing the cross-equation restriction using the Likelihood ratio test is also considered during this stage. If the LR test decision goes in favour of a more restricted model, we should estimate the VAR model using fewer lags. Hence appropriate lag lengths can be chosen by paring down the 'lag length' using the likelihood ratio test, especially when the sample size is not small.

The table below shows the optimal convergence of the lag length for the VAR system that was estimated thereafter. The information criteria are the LR test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ).

The next step would to estimate and determine long run relationship using an ARDL approach. Firstly, a lag order is selected and the Schwarz (Bayes) Criterion (SBC) is generally used in this regard because it is a consistent model-selector. However, caution should be exercised in order to prevent the possibility of over-selecting the maximum lags. The determination of the lag order is

dictated by the fact that the computation of F-statistics for cointegration is very sensitive to lag length. The lag length that minimizes SBC is 2.

Table 4.2 VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria

Endogenous variables: LGDPQ

Exogenous variables: C

Date: 06/11/19 Time: 13:54

Sample: 2009Q1 2018Q4

Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7.239041	NA	0.091400	0.445354	0.488892	0.460703
1	121.2045	243.0013	9.32e-05	-6.443486	-6.356409	-6.412787
2	131.7656	19.40958*	5.56e-05*	-6.960302*	-6.829687*	-6.914254*
3	132.1055	0.606391	5.76e-05	-6.924623	-6.750470	-6.863226

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: author's compilation and values obtained from E views

At the chosen lag length which in this case is two (2) and at 5 per cent level of significance, the Vector Auto Regression system should satisfy the stability condition. This happens when all the inverse roots of the characteristic AR polynomial have a modulus of less than one and lie inside the unit circle. The results indicate that the estimated Vector Auto Regression is stable or satisfies the stability condition as shown in table 4.3 below.

Table 4.3 Roots of Characteristic Polynomial

Root	Modulus
0.981000	0.981000
0.673331	0.673331

No root lies outside the unit circle.
VAR satisfies the stability condition.

Source: author's compilation and values obtained from E views

Another useful argument is presented by Hendry and Juselius (2001) in the literature, in the context of Johansen cointegration. The authors suggest that the lag length ought to be set such that the Vector Auto Regression residuals are free of autocorrelation (the error term observation do not form a pattern), even if this implies longer lags than suggested by the information criteria.

4.2.3 Cointegration Test

In order to estimate a system of equation of a dynamic structure, a support mechanism between the variables of interest either in the short run or in the long run has to be established. This will help to identify the relationship between variables, with reference to long run equilibrium. The approach used to test for cointegration in this regard is the Johansen cointegration test. The null hypothesis is that $r=0$ against the general alternative hypothesis $r \geq 1$, or $r \geq 2, 3, 4$. In this regard a λ -trace statistic is employed, since the null hypothesis is $r=0$ and there are four variables (i.e., $n=4$). The trace-statistics have a very general alternative hypothesis. A more specific hypothesis is tested and in this regard a λ -maximal test is applied and the null hypothesis is that $r=0$ against the specific alternative hypotheses $r=1$.

Table 4.4: Johansen Cointegration Test

Maximum Eigen Test				Trace Test			
H ₀ : rank = r	H _a : rank = r	Statistic	95% Critical Value	H ₀ : rank = r	H _a : rank = r	Statistic	95% Critical Value
r = 0	r = 1	47.09883*	27.584	r = 0	r ≥ 1	77.68489*	47.856
r ≤ 1	r = 2	17.09821	21.132*	r ≤ 1	r ≥ 2	30.58605	29.797*
r ≤ 2	r = 3	13.25541	14.265*	r ≤ 2	r ≥ 3	13.48784	15.495*
r ≤ 3	r = 4	0.232431	3.841*	r ≤ 3	r ≥ 4	0.232431	3.841*

Note: Both Max-eigenvalue and Trace tests indicates 1 cointegrating equations at the 0.05 level.

Source: author's compilation and values obtained from E views

Cointegration tests analyse non-stationary time series processes that have variances and means that show a discrepancy over time. In other words, the method allows us to estimate the long-run parameters or equilibrium in systems with unit root variables. Table 4.4 show the results for the Johansen cointegration test grounded on a Vector Auto Regression system of four variables namely; Bank Lending, Output growth, Inflation and interest rate (represented by repo rate). The null hypothesis is that there is no cointegration among the four variables. Both the Trace and Maximum Eigen value tests show that there is cointegration among the variables. This is because the calculate t-statistics (47.09 and 77.68 respectively) are greater than the critical value (27.58 and 47.85) at 5 per cent significance level. Therefore, the null hypothesis of no cointegration is rejected and the alternative hypothesis is accepted that indeed there are co-integrating vectors between these variables. These results are also similar to those of Ocran and Sheefeni (2013).

Table 4.5: Serial Correlation

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	25.79309	16	0.0570	1.744685	(16, 67.8)	0.0588
2	15.63662	16	0.4786	0.985221	(16, 67.8)	0.4825

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	25.79309	16	0.0570	1.744685	(16, 67.8)	0.0588
2	34.89894	32	0.3318	1.110687	(32, 68.0)	0.3509

*Edgeworth expansion corrected likelihood ratio statistic.

Source: author's compilation and values obtained from E views

When error terms from different time periods are correlated, this problem is referred to as serial correlation. It has a negative impact on the findings when one is carrying out a study hence it needs to be addressed. Table 4.5 shows that there is no serial correlation between the variables and their lagged version overtime intervals. This is evident because we fail to reject the null hypothesis according to the probability value of 0.0588 and 0.3509 at 5 per cent level of significant. Serial correlation tells us about the relationship between a variable and a lagged version of itself over various time intervals. Repeating patterns often show serial correlation when the level of a variable affects its future level.

Table 4.6: Goodness-of-fit

Component	Jarque-Bera	df	Prob.
1	22.80984	2	0.0000
2	0.261933	2	0.8772
3	0.695218	2	0.7064
4	4.397217	2	0.1110
Joint	28.16421	8	0.0004

*Approximate p-values do not account for coefficient estimation

Source: author's compilation and values obtained from E views

Jarque-Bera test is used in table 4.6 above to see whether the variables under investigation namely; output growth, bank lending, inflation and interest rate (represented by repo rate) have the skewness and kurtosis matching a normal distribution. The results show that the variables are jointly normally distributed with a significant p-value of 0.0004. In others words, the distance or the test statistic is less than the threshold value which is also referred to as the critical value, therefore, the fit is considered good.

Heteroscedasticity test is carried out to determine whether there are sub-populations (variables used in the study) that have different variabilities from the others.

Table 4.7: Heteroskedasticity test

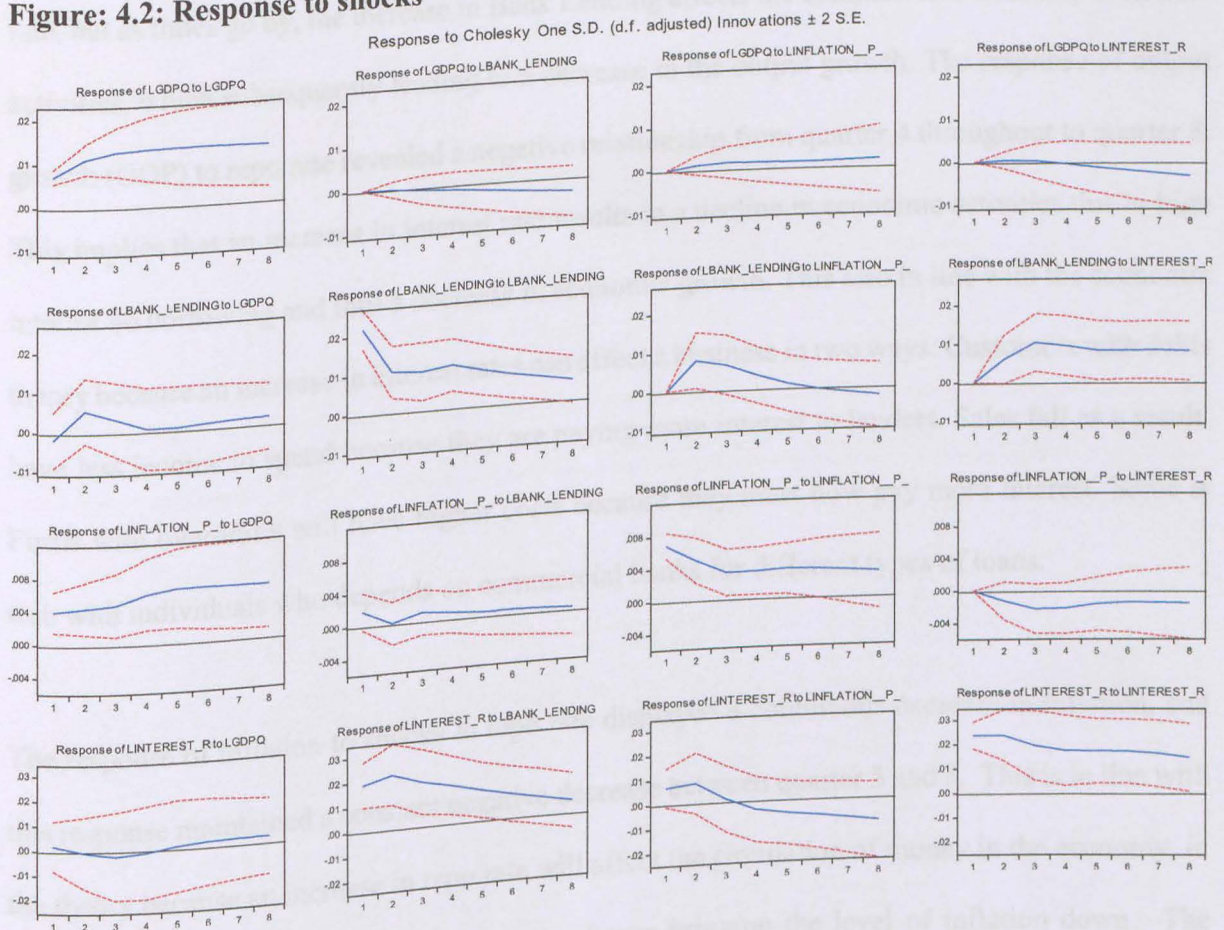
Joint test:		
Chi-sq	df	Prob.
147.8017	160	0.7462

Source: author's compilation and values obtained from E views

This is the basis of the Breusch–Pagan test. It is a chi-squared test: the test statistic is distributed $n\chi^2$ with k degrees of freedom. If the test statistic has a p-value below an appropriate threshold

(e.g. $p < 0.05$) then the null hypothesis of homoscedasticity is rejected and heteroscedasticity assumed. The table above proves that there is no heteroscedasticity within the variables under study but they are rather homoscedastic, which implies that the variance of the residual term is constant or nearly so. It further suggests that the regression model is well defined and it provides a good explanation of the performance of dependent variable. This is proved by the p-value which 0.7462 higher than the threshold of 0.05. A more serious problem associated with heteroscedasticity is the fact that the standard errors are biased.

Figure: 4.2: Response to shocks



Source: author's compilation and values obtained from E views

Figure 2 shows the response from the four variables themselves namely (bank lending, output growth, inflation and interest rate). Firstly, the response of Gross Domestic Product or output growth to shocks imposed on itself showed an immediate positive response between quarter 1 and quarter 2 and a constant decrease is experienced after quarter 3 throughout to the last quarter. Secondly, the response of Gross Domestic Product to shocks on Bank Lending displayed a constant in Gross Domestic Product between quarter 1 and 2 and then a continuous negative decrease after quarter 3 which exhibited a more negative response throughout to quarter 8. This is in line with the theory because in a short-term, the economy responds positively to an increase in Bank Lending rate, but as times go by, the increase in Bank Lending affects the commercial Banks and economic activities, which subsequently leading to a decrease in the output growth. The response of output growth (GDP) to repo rate revealed a negative relationship from quarter 4 throughout to quarter 8. This implies that an increase in interest rate results in a decline in economic activities due to high interest on borrowing and thus a decrease in economic growth. This also in line with the economic theory because an increase in interest rates can affect a business in two ways: Customers with debts have less income to spend because they are paying more interest to lenders. Sales fall as a result. Firms with overdrafts will have higher costs because they must now pay more interest. Same is true with individuals who depends on commercial banks for different types of loans.

The response of inflation to shocks to repo rate displayed a continuous decrease in inflation, and this response maintained a constant negative decrease between quarter 5 and 8. This is in line with the theory because an increase in repo rate will affect the circulation of money in the economy, in other words it reduces the purchasing power hence bringing the level of inflation down. The response of Inflation to shocks in GDP showed a continuous increase between quarter 1 and 5 and

maintained a constant increase between quarter 5 and 8. This solidify the theory that the level of economic activities can lead to more money in circulation and this leads to inflation. Furthermore, the response of interest rate (repo rate) to inflation shocks revealed a negative relationship. This implies that interest rate affects all businesses, large and small, and interest rates typically falls during recession.

The central bank uses its financial tools to nudge the rates down, and theoretically the basic law of demand and supply comes into play. Lastly, the results in the panel of Interest Rate and output (GDP) are in line with economic theory in a sense that, an increase in Gross Domestic Product reduces the repo rate (interest rate) in a short-run but it however increases in order to control the economic activities which could lead to inflation if not controlled. Inflation is not good for the economy if it is not controlled and this can lead to hyperinflation and subsequently the collapse of the economy.

Table 4.5: Forecast Error Variance Decomposition

Variance Decomposition of LBANK_LENDING: Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.021754	0.714461	99.28554	0.000000	0.000000
2	0.026665	4.746050	81.33588	8.771604	5.146467
3	0.031111	4.547874	69.89485	10.71904	14.83823
4	0.034524	3.735856	66.97705	9.789157	19.49794
5	0.036713	3.338753	65.56103	8.759533	22.34069
6	0.038421	3.168899	63.81365	8.008456	25.00899
7	0.039902	3.151801	61.74612	7.540090	27.56199
8	0.041161	3.223603	59.62680	7.381806	29.76779
9	0.042213	3.350750	57.60121	7.559224	31.48881
10	0.043095	3.527918	55.70746	8.032005	32.73261
11	0.043846	3.747248	53.97605	8.718319	33.55838
12	0.044492	3.992185	52.44753	9.536975	34.02331
13	0.045052	4.245735	51.15199	10.41888	34.18340
14	0.045543	4.495025	50.10060	11.30343	34.10095
15	0.045975	4.730861	49.28824	12.13811	33.84279
16	0.046361	4.946451	48.69746	12.88207	33.47402
17	0.046708	5.137006	48.30140	13.50867	33.05293
18	0.047021	5.299823	48.06697	14.00506	32.62815
19	0.047306	5.434186	47.95816	14.37033	32.23732
20	0.047565	5.541006	47.93916	14.61312	31.90672

Source: author's compilation and values obtained from E views

Table 4.5 shows forecast Error Variance Decomposition for bank lending in the model over a 20-quarter forecast distance. In the first quarter, the fluctuation in bank lending is mostly caused by itself with 99%. In the second quarter throughout to quarter 6, the fluctuation by bank lending decrease by 18%. After 10 quarter, other variables such as interest rate and inflation contributed more than the others, about 32% and 8% respectively. Inflation made a visible contribution after 18 quarter of about 14% while output growth was insignificant at quarter 20. It is worth noting that there is an economic relationship between Bank Lending and Repo Rate, such that if interest rate is high, any shock to it (increased or decreased) will bring about a fluctuation in Bank Lending and this is evident in the results above.

Table 4.6: Forecast Error Variance Decomposition

Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.008116	24.50425	4.607221	70.88853	0.000000
2	0.010558	32.47807	2.730935	63.44054	1.350460
3	0.012313	39.14719	2.838430	53.83656	4.177822
4	0.014292	46.68289	2.427511	45.54366	5.345940
5	0.016226	52.74323	2.001057	40.12604	5.129668
6	0.017937	56.84379	1.747443	36.60778	4.800987
7	0.019441	59.82383	1.558361	33.98092	4.636896
8	0.020798	62.19696	1.392456	31.83167	4.578913
9	0.022048	64.15224	1.248307	30.03805	4.561404
10	0.023210	65.76986	1.127408	28.53355	4.569181
11	0.024294	67.10643	1.029545	27.25593	4.608096
12	0.025311	68.21026	0.953263	26.15531	4.681163
13	0.026270	69.11950	0.896723	25.19845	4.785325
14	0.027181	69.86277	0.857700	24.36366	4.915875
15	0.028047	70.46240	0.833583	23.63502	5.068995
16	0.028875	70.93726	0.821595	22.99961	5.241537
17	0.029667	71.30400	0.818974	22.44675	5.430279
18	0.030427	71.57761	0.823100	21.96757	5.631719
19	0.031157	71.77155	0.831585	21.55461	5.842255
20	0.031858	71.89796	0.842358	21.20132	6.058363

Source: author's compilation and values obtained from E views

Table 4.6 presents forecast Error Variance Decomposition for inflation (prices) in the model over a 20-quarter forecast distance. In the first quarter, inflation contributed about 70% to the fluctuation, while GDP contributed fairly on the fluctuation with 24% and the other variables

contributed relatively low with interest rate not contributing anything. At quarter 4 the contribution of GDP to the fluctuation of inflation is equal to the one caused by inflation. Furthermore, in quarter 8, GDP contribution is more significance of about 62% than inflation which contributed 31% and bank lending and interest rate with 1.4% and 4.6% respectively. The contribution of GDP continued to increase throughout to the last quarter more than any other variable. After 18 quarter, the fluctuation in inflation was significantly caused by GDP with 71%, 21% by inflation and 6% contributed by interest rate respectively. If economic activities are increasing at a fast pace and there is no control of the transactions or the way money is changing hands, this can affect the fluctuation of inflation and it is best explained by the findings in the table above.

Table 4.7: Forecast Error Variance Decomposition

Variance Decomposition of LGDPQ:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.007196	100.0000	0.000000	0.000000	0.000000
2	0.013290	99.10909	0.000336	0.741107	0.149470
3	0.018448	98.64990	0.072337	1.153864	0.123903
4	0.022713	98.47049	0.231267	1.196548	0.101691
5	0.026429	98.05684	0.522713	1.150999	0.269447
6	0.029788	97.31849	0.941221	1.128167	0.612121
7	0.032860	96.32743	1.427720	1.155046	1.089802
8	0.035689	95.13996	1.934730	1.232010	1.693303
9	0.038317	93.79922	2.430991	1.357390	2.412401
10	0.040778	92.35101	2.892327	1.534391	3.222272
11	0.043097	90.84049	3.300113	1.768070	4.091331
12	0.045290	89.30633	3.642119	2.061636	4.989912
13	0.047369	87.77944	3.912678	2.415398	5.892481
14	0.049342	86.28422	4.111650	2.827217	6.776911
15	0.051217	84.83981	4.242939	3.292982	7.624266
16	0.052998	83.46072	4.313206	3.806831	8.419247
17	0.054691	82.15735	4.330817	4.361353	9.150476
18	0.056299	80.93672	4.304971	4.947965	9.810345
19	0.057826	79.80303	4.244977	5.557367	10.39463
20	0.059276	78.75826	4.159701	6.180005	10.90204

Source: author's compilation and values obtained from E views

Table 4.7 presents forecast error variance decomposition for output growth (GDP) in the model over a 20-quarter forecast horizon. In quarter 1, the fluctuation is caused by the output growth

with 100% and other variables being insignificant. The fluctuation caused by GDP continued to be significant throughout quarter 2 to 9 with inflation contributing about 1.3%. After 10 quarters, the contribution of bank lending, inflation and interest rate increased but remained insignificant, while the contribution of GDP decreased at a minimal amount throughout until the last quarter which contributed about 78%. In the last quarter, the fluctuation caused by bank lending, inflation and interest rate is 4%, 6% and 10% respectively.

The results above make economic sense. Although the fluctuation of Gross Domestic Product was caused by itself, there are two observations that can be drawn from these results. Firstly, if Bank Lending decreases, this translates into a decrease in interest (repo rate), which then means that firms and households will be able to borrow more money so economic activities will increase and at the same time inflation will be experienced in a short-run. Secondly, if Bank Lending increases, interest rate (repo rate) will also decrease and this will translate in increased borrowing by firms and households to buy goods and services in the market, subsequently inflation will decline.

Table 4.8: Forecast Error Variance Decomposition

Variance Decomposition of LINTEREST_R:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.031006	0.407691	36.49401	4.671892	58.42641
2	0.045517	0.212573	40.24256	5.333181	54.21169
3	0.052724	0.328771	41.59696	4.026712	54.04756
4	0.057747	0.308545	41.77773	3.757273	54.15646
5	0.061791	0.300625	40.51401	4.045092	55.14027
6	0.065257	0.387665	38.56528	4.656369	56.39069
7	0.068179	0.498418	36.54513	5.660039	57.29642
8	0.070603	0.622403	34.62674	7.045222	57.70563
9	0.072642	0.766666	32.87960	8.678638	57.67510
10	0.074384	0.925776	31.37400	10.40648	57.29375
11	0.075884	1.086003	30.15835	12.11946	56.63618
12	0.077183	1.235620	29.24893	13.74324	55.77221
13	0.078316	1.368071	28.63626	15.21878	54.77689
14	0.079310	1.480024	28.29304	16.50109	53.72584
15	0.080187	1.569812	28.17968	17.56400	52.68651
16	0.080964	1.637244	28.24920	18.40051	51.71306
17	0.081652	1.683647	28.45218	19.01932	50.84485
18	0.082264	1.711582	28.74089	19.44077	50.10675
19	0.082806	1.724375	29.07238	19.69302	49.51022
20	0.083286	1.725694	29.41055	19.80863	49.05512

Source: author's compilation and values obtained from E views

Table 4.8 presents forecast error variance decomposition for output growth in the model over a 20-quarter forecast horizon. In quarter 1, the fluctuation is caused by the interest rate with 58.4%, Bank Lending with 36.5% and other variables such as inflation and GDP being insignificant. After 11 quarters, the contribution of Bank Lending decreased to 30% and continued to decrease throughout to the last quarter but it remained significant, while inflation increased with a significant figure of about 19% from quarter 15 throughout to the last quarter 20. Interest rate on the other hand decreased at a minimal rate (from 57% at quarter 7 to 49% in the last quarter (20). Gross Domestic Product remained insignificant throughout the quarters. Contributing only over 1% to the fluctuation.

4.1.4 Summary

This chapter used VAR/VECM, cointegration tests, generalised impulse response function and generalised forecast error variance techniques to test the variables namely: output growth (GDP), Bank Lending (BL), Inflation (P) and Interest Rate represented by Repo Rate (R). The study further carried out an additional technique, the autoregressive distributed lag model. Additionally, the study tested for serial correlation, Goodness-of-fit and Heteroskedasticity to ensure that the variables did not give spurious results which could contradict the economic theories and other similar studies by different scholars. The end results from the empirical models indicate that there is a positive and significant long run relationship between repo rate and bank lending which transform to output growth. This relationship is further extended to other variables such as inflation and output growth. The results and analysis are confined to the data-set used; however, they provide very important statistical observations which are meaningful to this study. The findings are similar to those of Sheefeni and Ocran (2013) and Opolot (2013). Both authors' results of

econometric analysis support the presence of a significant bank lending channel in Namibia and in Uganda respectively. That is, changes in the monetary policy instruments or mechanisms affect the credit variable which in turn passes on the shocks to output and prices. The study established that the credit channel (specifically the bank lending) serves as a good means of transportation to transmit shocks innovated by monetary policy actions to the real side of the economy. The next chapter presents the conclusions and recommendations for the study.

5.2 Conclusions

In order to determine the effectiveness of transmission mechanisms of monetary policy in Namibia, particularly the credit channel, the research carefully looked at how repo rate, bill rates (prices) affect output growth through the bank lending. The study employed time series techniques such as generalized impulse response function and generalized forecast error variance analysis within the Vector Auto Regression framework. The study also employed the autocorrelation distributive lag model to address the issue concerning co-integration analysis in a Vector Auto Regression framework. Additionally, serial correlation, heteroscedastic and linearity tests were examined.

This study followed Kao, Liu and Ho (2010) and Harding (2013)'s approach to test the existence of the bank lending channel in order to explain the monetary policy transmission in Namibia, and this was motivated by the complicated nature of the post crisis relationship between the variables, which cannot be explained by a single equation model like other studies which have also

CHAPTER FIVE: CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

The research project examined the transmission of monetary policy through the bank lending channel in Namibia. In chapter 4, the researcher analysed the results of the estimation of the various econometric models that were developed in chapter 3 of the thesis. In this particular chapter, a summary of the entire thesis is presented. Further, the researcher puts forward important policy implications arising from the study. In addition, some useful suggestions in respect of forthcoming research are presented. Further, this chapter summarises the work, results and implications of this study.

5.2 Conclusions

In order to determine the effectiveness of transmission mechanisms of monetary policy in Namibia, particularly the credit channel, the research carefully looked at how repo rate, inflation (prices) affect output growth through the bank lending. The study employed time-series techniques such as generalised impulse response functions and generalised forecast error variance analysis within the Vector Auto Regression framework. The study also employed the autoregressive distributive lag model to address the issue concerning co-integration analysis in a Vector Auto Regression framework. Additionally, serial correlation, Goodness-of-fit and Heteroscedasticity were examined.

This study followed Sun, Gan and Hu (2010) and Hosing (2013)'s approach to test the existence of the bank lending channel in order to explain the monetary policy transmission in Namibia, and this was informed by the complicated nature of the economic relationships between the variables, which cannot be explained by a single equation model like other studies which have slim

similarities. It is also worth mentioning that the majority of empirical studies have predominantly used the Vector Auto Regression approach in analysing monetary policy transmission mechanisms. Hence, that justified the use of this approach.

The Vector Auto Regression analysis confirms that individual series are non-stationary at their level. In other words, they are integrated of order one. It also shows that there is a long run cointegrating relationship between bank lending (bl), output (GDP), interest rate represented by repo rate (r) and the rate of inflation (p). These observations triggered the author to carry out further tests in order to address the co-integration issue. It is observed that output, repo rate and the rate of inflation plays an important role in the determination of the demand for credit behaviour of firms and households in Namibia. The objective of the research was to investigate the impact of monetary policy on the real economy through the bank lending channel in Namibia. The objective or research question of this research is cemented by the findings that bank lending as a channel for monetary policy transmission has an effect on economic activities in Namibia. The study therefore rejects the Null Hypothesis (The Bank Lending Channel is not effective as a monetary policy) and accepted the Alternative Hypothesis (The Bank Lending Channel is effective as a monetary policy). The study is partially and at some point completely in line with some of the early findings such as a study in Namibia by Sheefeni and Ocran (2013) which showed that the execution or implementation of monetary policy was effective during the period 1993-2011.

Some other important empirical findings worth noting were the significant impact of output on bank lending. In other words, an increase in bank lending results in a diminishing level of economic activities, which is in line with economic theory. The significance of the rate of inflation in the demand for credit function implies that the policies that are successful in reducing the rate of

inflation will also lead to a decrease in the demand for credit by firms. The study also recognised that the fluctuations in bank lending have been mainly caused by itself over the forecast horizon, with repo rate being significant, while inflation and output being insignificant for some time. In light of the findings, this study confirms the significant impact and importance of bank lending as a channel for monetary policy transmission in Namibia.

5.3 Policy Recommendations

The results discussed in chapter four reveal that all the variables in the model are important in determining the effects of transmission mechanisms of monetary policy and the results obtained in this study have significant implications for monetary policy formulations and implementations. The following should be considered as a matter of policy consideration:

- The central bank is recommended to closely monitor repo rate as it has a significant impact on the economic activities which subsequently affect the output growth (GDP).
- The monetary authorities should put a mechanism in place to enhance the bank lending channel which proves to be effective in the long run. This can be done through banking supervision by the central bank or monetary authorities and can be tied with increased competition among commercial banks.
- The development of the financial sector will be essential to boosting the effectiveness of the other transmission channels such as interest rate and exchange rate. In addition, the central Bank of Namibia should improve the stock exchange market to expand the asset price channel.

The country will experience rapid economic transformation which will foster sustainable economic growth if the policies are effectively implemented. However, there are challenges which hinder the successful execution of these policies such as the timeframe between planning, approval and execution.

5.4 LIMITATIONS OF THE STUDY

Since the Bank Lending Channel can be looked at from the demand and supply side, this study is limited to the Supply side because most of the literature review represents the supply side. The research is also to some point constrained by the unavailability of long time series data. This is critical in the sense that it would have enhanced the robustness of the model estimated and the results thereof.

5.5 AREAS FOR FURTHER RESEACRH

The aim of this study was to investigate the transmission of monetary policy through the bank lending channel in Namibia, which is part of the credit channel. The study did not take into consideration all the channels of monetary policy and how they impact on output. The future areas of research could include all the channels and investigate how they will impact on the economy. Another area for research is the examination of the presence of the lending channel relative to banks' capitalisation with the use of banks' capital leverage ratio which was not implemented in this research because of data limitations. An understanding of the transmission process is essential to the appropriate design and implementation of monetary policy. Due to the changes in the structure of the economy, including changes in the balance sheet position, in financial sector technology and institutions, or in expectations, in financial sector technology and institutions, or in expectations concerning future policy which tends to alter the economic effects of a given

monetary policy measure, central banks need to be alert to the impact of structural change. They need to be able to continuously reinterpret the channels of transmission of monetary policy.

The study covers only evidence on the bank lending channel. Empirical studies can be done on providing evidence for the evidence of the borrowers' net worth channel in the Namibian economy. Finally, as an extension, this study can be supplemented to cover previous years to be able to accurately demonstrate the presence of the bank lending channel in Namibia.

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Appendices

A.1 Description of variables

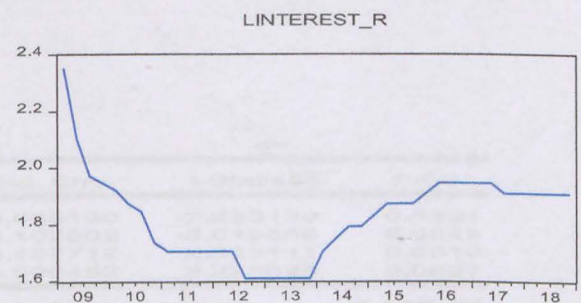
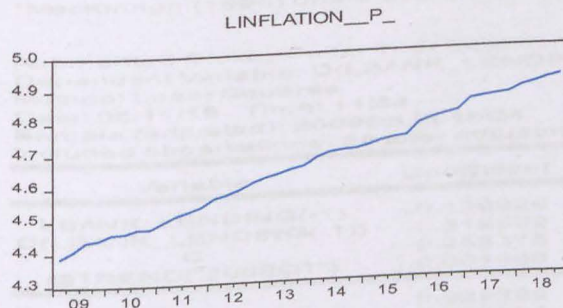
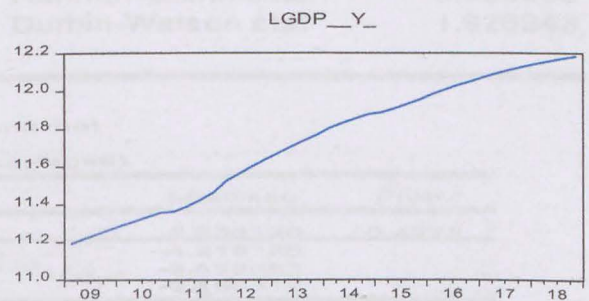
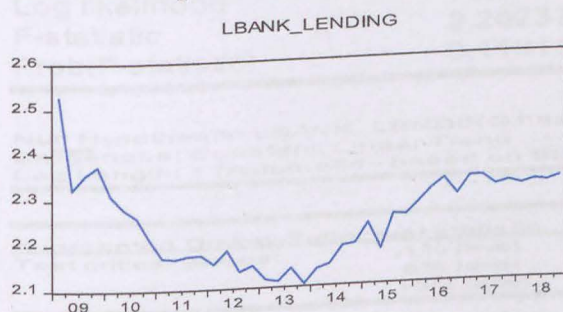
Repo Rate: Repo rate is the rate at which the central bank of a country (BoN in case of Namibia) lends money to commercial banks in the event of any shortfall of funds. Repo rate is used by monetary authorities to control inflation.

Inflation: the rate at which prices increase over time, resulting in a fall in the purchasing value of money.

Bank Lending rate: bank lending rate, the lowest rate of interest at which banks can lend money to other banks in the case of Namibia its 10.50

Gross Domestic Product (output growth): represents the total monetary value of all final goods and services produced (and sold on the market) within a country during a period of time (typically 1 year).

A.2 Descriptive Analysis



Null Hypothesis: LBANK_LENDING has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.270549	0.6332
Test critical values: 1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LBANK_LENDING)
 Method: Least Squares
 Date: 06/11/19 Time: 11:45
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBANK_LENDING(-1)	-0.080250	0.063162	-1.270549	0.2123
D(LBANK_LENDING(-1))	-0.188238	0.109828	-1.713941	0.0954
C	0.178086	0.141142	1.261752	0.2154
R-squared	0.114479	Mean dependent var		-5.16E-05
Adjusted R-squared	0.063878	S.D. dependent var		0.031863
S.E. of regression	0.030829	Akaike info criterion		-4.045078
Sum squared resid	0.033265	Schwarz criterion		-3.915795
Log likelihood	79.85649	Hannan-Quinn criter.		-3.999080
F-statistic	2.262375	Durbin-Watson stat		1.926343
Prob(F-statistic)	0.119119			

Null Hypothesis: LBANK_LENDING has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.235130	0.4575
Test critical values: 1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LBANK_LENDING)
 Method: Least Squares
 Date: 06/11/19 Time: 11:54
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBANK_LENDING(-1)	-0.129929	0.058130	-2.235130	0.0321
D(LBANK_LENDING(-1))	-0.318602	0.105502	-3.019856	0.0048
C	0.258375	0.127712	2.023111	0.0510
@TREND("2009Q1")	0.001459	0.000452	3.229828	0.0027
R-squared	0.322383	Mean dependent var		-5.16E-05
Adjusted R-squared	0.262594	S.D. dependent var		0.031863
S.E. of regression	0.027362	Akaike info criterion		-4.260041
Sum squared resid	0.025455	Schwarz criterion		-4.087664
Log likelihood	84.94078	Hannan-Quinn criter.		-4.198711
F-statistic	5.391955	Durbin-Watson stat		2.146661
Prob(F-statistic)	0.003815			

Null Hypothesis: LGDPQ has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.913721	0.3223
Test critical values: 1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDPQ)
Method: Least Squares
Date: 06/11/19 Time: 11:57
Sample (adjusted): 2010Q3 2018Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDPQ(-1)	-0.008960	0.004682	-1.913721	0.0663
D(LGDPQ(-1))	0.643850	0.176165	3.654822	0.0011
D(LGDPQ(-2))	0.171296	0.188128	0.910528	0.3706
D(LGDPQ(-3))	0.057851	0.190765	0.303259	0.7640
D(LGDPQ(-4))	-0.547844	0.188380	-2.908187	0.0072
D(LGDPQ(-5))	0.357961	0.175047	2.044946	0.0507
C	0.113546	0.057015	1.991509	0.0566
R-squared	0.669259	Mean dependent var		0.025719
Adjusted R-squared	0.595761	S.D. dependent var		0.010614
S.E. of regression	0.006748	Akaike info criterion		-6.977864
Sum squared resid	0.001230	Schwarz criterion		-6.663613
Log likelihood	125.6237	Hannan-Quinn criter.		-6.870696
F-statistic	9.105816	Durbin-Watson stat		2.049961
Prob(F-statistic)	0.000018			

Null Hypothesis: LGDPQ has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.765802	0.9591
Test critical values: 1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDPQ)
Method: Least Squares
Date: 06/11/19 Time: 11:59
Sample (adjusted): 2010Q3 2018Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDPQ(-1)	-0.036473	0.047627	-0.765802	0.4507
D(LGDPQ(-1))	0.670997	0.184395	3.638904	0.0012
D(LGDPQ(-2))	0.180678	0.191166	0.945139	0.3533
D(LGDPQ(-3))	0.071504	0.194577	0.367486	0.7162
D(LGDPQ(-4))	-0.526193	0.194347	-2.707487	0.0118
D(LGDPQ(-5))	0.398944	0.190777	2.091150	0.0464
C	0.416931	0.525755	0.793013	0.4349
@TREND("2009Q1")	0.000798	0.001374	0.580555	0.5665
R-squared	0.673492	Mean dependent var		0.025719
Adjusted R-squared	0.585586	S.D. dependent var		0.010614
S.E. of regression	0.006833	Akaike info criterion		-6.931921
Sum squared resid	0.001214	Schwarz criterion		-6.572777
Log likelihood	125.8427	Hannan-Quinn criter.		-6.809442
F-statistic	7.661491	Durbin-Watson stat		2.081161
Prob(F-statistic)	0.000049			

Null Hypothesis: LINFLATION__P_ has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.776509	0.8146
Test critical values: 1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LINFLATION__P_)
 Method: Least Squares
 Date: 06/11/19 Time: 12:03
 Sample (adjusted): 2009Q2 2018Q4
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINFLATION__P_(-1)	-0.007014	0.009033	-0.776509	0.4424
C	0.045879	0.042020	1.091830	0.2820
R-squared	0.016035	Mean dependent var		0.013267
Adjusted R-squared	-0.010559	S.D. dependent var		0.008398
S.E. of regression	0.008442	Akaike info criterion		-6.661324
Sum squared resid	0.002637	Schwarz criterion		-6.576013
Log likelihood	131.8958	Hannan-Quinn criter.		-6.630715
F-statistic	0.602966	Durbin-Watson stat		2.254370
Prob(F-statistic)	0.442385			

Null Hypothesis: LINFLATION__P_ has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.278106	0.0849
Test critical values: 1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LINFLATION__P_)
 Method: Least Squares
 Date: 06/11/19 Time: 12:08
 Sample (adjusted): 2009Q2 2018Q4
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINFLATION__P_(-1)	-0.456168	0.139156	-3.278106	0.0023
C	2.014569	0.610065	3.302220	0.0022
@TREND("2009Q1")	0.005982	0.001850	3.233131	0.0026
R-squared	0.237452	Mean dependent var		0.013267
Adjusted R-squared	0.195088	S.D. dependent var		0.008398
S.E. of regression	0.007534	Akaike info criterion		-6.864967
Sum squared resid	0.002043	Schwarz criterion		-6.737001
Log likelihood	136.8669	Hannan-Quinn criter.		-6.819054
F-statistic	5.605078	Durbin-Watson stat		1.857623
Prob(F-statistic)	0.007600			

Null Hypothesis: LINTEREST_R has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.433130	0.0011
Test critical values: 1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINTEREST_R)
Method: Least Squares
Date: 06/11/19 Time: 12:11
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINTEREST_R(-1)	-0.214287	0.048338	-4.433130	0.0001
C	0.380424	0.088680	4.289838	0.0001
R-squared	0.346897	Mean dependent var	-0.011329	
Adjusted R-squared	0.329246	S.D. dependent var	0.056571	
S.E. of regression	0.046331	Akaike info criterion	-3.256069	
Sum squared resid	0.079424	Schwarz criterion	-3.170758	
Log likelihood	65.49335	Hannan-Quinn criter.	-3.225460	
F-statistic	19.65264	Durbin-Watson stat	0.709704	
Prob(F-statistic)	0.000080			

Null Hypothesis: LINTEREST_R has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.395963	0.3757
Test critical values: 1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINTEREST_R)
Method: Least Squares
Date: 06/11/19 Time: 12:15
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINTEREST_R(-1)	-0.111857	0.046686	-2.395963	0.0222
D(LINTEREST_R(-1))	0.224754	0.118919	1.889979	0.0673
C	0.172160	0.078887	2.182373	0.0361
@TREND("2009Q1")	0.001385	0.000613	2.260067	0.0303
R-squared	0.470718	Mean dependent var	-0.005024	
Adjusted R-squared	0.424017	S.D. dependent var	0.041167	
S.E. of regression	0.031243	Akaike info criterion	-3.994760	
Sum squared resid	0.033188	Schwarz criterion	-3.822382	
Log likelihood	79.90043	Hannan-Quinn criter.	-3.933429	
F-statistic	10.07934	Durbin-Watson stat	2.014013	
Prob(F-statistic)	0.000067			

Null Hypothesis: LBANK_LENDING has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.348662	0.0193
Test critical values:		
1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001538
HAC corrected variance (Bartlett kernel)	0.002246

Phillips-Perron Test Equation
Dependent Variable: D(LBANK_LENDING)
Method: Least Squares
Date: 06/11/19 Time: 12:21
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBANK_LENDING(-1)	-0.242531	0.070748	-3.428098	0.0015
C	0.538132	0.158666	3.391602	0.0017
R-squared	0.241055	Mean dependent var		-0.005341
Adjusted R-squared	0.220542	S.D. dependent var		0.045605
S.E. of regression	0.040263	Akaike info criterion		-3.536824
Sum squared resid	0.059982	Schwarz criterion		-3.451513
Log likelihood	70.96807	Hannan-Quinn criter.		-3.506215
F-statistic	11.75186	Durbin-Watson stat		1.764566
Prob(F-statistic)	0.001506			

Null Hypothesis: LBANK_LENDING has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-4.182074	0.0108
Test critical values:		
1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001214
HAC corrected variance (Bartlett kernel)	0.000978

Phillips-Perron Test Equation
Dependent Variable: D(LBANK_LENDING)
Method: Least Squares
Date: 06/11/19 Time: 12:24
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBANK_LENDING(-1)	-0.254424	0.063828	-3.986054	0.0003
C	0.532719	0.142900	3.727918	0.0007
@TREND("2009Q1")	0.001603	0.000517	3.101871	0.0037
R-squared	0.401116	Mean dependent var		-0.005341
Adjusted R-squared	0.367845	S.D. dependent var		0.045605
S.E. of regression	0.036260	Akaike info criterion		-3.722404
Sum squared resid	0.047332	Schwarz criterion		-3.594438
Log likelihood	75.58689	Hannan-Quinn criter.		-3.676491
F-statistic	12.05592	Durbin-Watson stat		2.189707
Prob(F-statistic)	0.000098			

Null Hypothesis: LGDPQ has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.557544	0.4943
Test critical values:		
1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	8.23E-05
HAC corrected variance (Bartlett kernel)	0.000233

Phillips-Perron Test Equation
Dependent Variable: D(LGDPQ)
Method: Least Squares
Date: 06/11/19 Time: 12:26
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDPQ(-1)	-0.011662	0.004746	-2.457007	0.0188
C	0.162146	0.055642	2.914118	0.0060
R-squared	0.140272	Mean dependent var		0.025483
Adjusted R-squared	0.117036	S.D. dependent var		0.009913
S.E. of regression	0.009315	Akaike info criterion		-6.464456
Sum squared resid	0.003210	Schwarz criterion		-6.379145
Log likelihood	128.0569	Hannan-Quinn criter.		-6.433847
F-statistic	6.036883	Durbin-Watson stat		0.666238
Prob(F-statistic)	0.018821			

Null Hypothesis: LGDPQ has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.222025	0.9902
Test critical values:		
1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	7.87E-05
HAC corrected variance (Bartlett kernel)	0.000211

Phillips-Perron Test Equation
Dependent Variable: D(LGDPQ)
Method: Least Squares
Date: 06/11/19 Time: 12:28
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDPQ(-1)	0.044312	0.043700	1.014007	0.3173
C	-0.462339	0.487838	-0.947730	0.3496
@TREND("2009Q1")	-0.001572	0.001220	-1.288367	0.2058
R-squared	0.178165	Mean dependent var		0.025483
Adjusted R-squared	0.132508	S.D. dependent var		0.009913
S.E. of regression	0.009233	Akaike info criterion		-6.458250
Sum squared resid	0.003069	Schwarz criterion		-6.330284
Log likelihood	128.9359	Hannan-Quinn criter.		-6.412337
F-statistic	3.902220	Durbin-Watson stat		0.735090
Prob(F-statistic)	0.029250			

Null Hypothesis: LINFLATION__P_ has a unit root
Exogenous: Constant
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.462951	0.5415
Test critical values: 1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	6.76E-05
HAC corrected variance (Bartlett kernel)	1.28E-05

Phillips-Perron Test Equation
Dependent Variable: D(LINFLATION__P_)
Method: Least Squares
Date: 06/11/19 Time: 12:30
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINFLATION__P_(-1)	-0.007014	0.009033	-0.776509	0.4424
C	0.045879	0.042020	1.091830	0.2820
R-squared	0.016035	Mean dependent var		0.013267
Adjusted R-squared	-0.010559	S.D. dependent var		0.008398
S.E. of regression	0.008442	Akaike info criterion		-6.661324
Sum squared resid	0.002637	Schwarz criterion		-6.576013
Log likelihood	131.8958	Hannan-Quinn criter.		-6.630715
F-statistic	0.602966	Durbin-Watson stat		2.254370
Prob(F-statistic)	0.442385			

Null Hypothesis: LINFLATION__P_ has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.339351	0.0749
Test critical values: 1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5.24E-05
HAC corrected variance (Bartlett kernel)	5.57E-05

Phillips-Perron Test Equation
Dependent Variable: D(LINFLATION__P_)
Method: Least Squares
Date: 06/11/19 Time: 12:31
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINFLATION__P_(-1)	-0.456168	0.139156	-3.278106	0.0023
C	2.014569	0.610065	3.302220	0.0022
@TREND("2009Q1")	0.005982	0.001850	3.233131	0.0026
R-squared	0.237452	Mean dependent var		0.013267
Adjusted R-squared	0.195088	S.D. dependent var		0.008398
S.E. of regression	0.007534	Akaike info criterion		-6.864967
Sum squared resid	0.002043	Schwarz criterion		-6.737001
Log likelihood	136.8669	Hannan-Quinn criter.		-6.819054
F-statistic	5.605078	Durbin-Watson stat		1.857623
Prob(F-statistic)	0.007600			

Null Hypothesis: LINTEREST_R has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.651018	0.0090
Test critical values: 1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.002037
HAC corrected variance (Bartlett kernel)	0.005443

Phillips-Perron Test Equation
Dependent Variable: D(LINTEREST_R)
Method: Least Squares
Date: 06/11/19 Time: 12:33
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINTEREST_R(-1)	-0.214287	0.048338	-4.433130	0.0001
C	0.380424	0.088680	4.289838	0.0001
R-squared	0.346897	Mean dependent var		-0.011329
Adjusted R-squared	0.329246	S.D. dependent var		0.056571
S.E. of regression	0.046331	Akaike info criterion		-3.256069
Sum squared resid	0.079424	Schwarz criterion		-3.170758
Log likelihood	65.49335	Hannan-Quinn criter.		-3.225460
F-statistic	19.65264	Durbin-Watson stat		0.709704
Prob(F-statistic)	0.000080			

Null Hypothesis: LINTEREST_R has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-5.295699	0.0005
Test critical values: 1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001161
HAC corrected variance (Bartlett kernel)	0.001729

Phillips-Perron Test Equation
Dependent Variable: D(LINTEREST_R)
Method: Least Squares
Date: 06/11/19 Time: 12:35
Sample (adjusted): 2009Q2 2018Q4
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINTEREST_R(-1)	-0.227024	0.037076	-6.123176	0.0000
C	0.351004	0.068106	5.153757	0.0000
@TREND("2009Q1")	0.002635	0.000506	5.211979	0.0000
R-squared	0.627772	Mean dependent var		-0.011329
Adjusted R-squared	0.607092	S.D. dependent var		0.056571
S.E. of regression	0.035460	Akaike info criterion		-3.767014
Sum squared resid	0.045267	Schwarz criterion		-3.639048
Log likelihood	76.45678	Hannan-Quinn criter.		-3.721101
F-statistic	30.35741	Durbin-Watson stat		1.208598
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBANK_LENDING) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.72029	0.0000
Test critical values:		
1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LBANK_LENDING,2)
 Method: Least Squares
 Date: 06/11/19 Time: 12:36
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBANK_LENDING(-1))	-1.187363	0.110758	-10.72029	0.0000
C	-0.001127	0.005084	-0.221763	0.8258
R-squared	0.761470	Mean dependent var		0.005690
Adjusted R-squared	0.754845	S.D. dependent var		0.062793
S.E. of regression	0.031091	Akaike info criterion		-4.052619
Sum squared resid	0.034799	Schwarz criterion		-3.966430
Log likelihood	78.99976	Hannan-Quinn criter.		-4.021954
F-statistic	114.9247	Durbin-Watson stat		2.000876
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBANK_LENDING) has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-11.68133	0.0000
Test critical values:		
1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LBANK_LENDING,2)
 Method: Least Squares
 Date: 06/11/19 Time: 12:37
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBANK_LENDING(-1))	-1.293413	0.110725	-11.68133	0.0000
C	-0.026168	0.010753	-2.433491	0.0202
@TREND("2009Q1")	0.001192	0.000460	2.591968	0.0138
R-squared	0.799883	Mean dependent var		0.005690
Adjusted R-squared	0.788448	S.D. dependent var		0.062793
S.E. of regression	0.028881	Akaike info criterion		-4.175579
Sum squared resid	0.029195	Schwarz criterion		-4.046296
Log likelihood	82.33601	Hannan-Quinn criter.		-4.129581
F-statistic	69.94889	Durbin-Watson stat		2.146477
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LGDPQ) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.149551	0.6844
Test critical values: 1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDPQ,2)
Method: Least Squares
Date: 06/11/19 Time: 12:38
Sample (adjusted): 2010Q3 2018Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDPQ(-1))	-0.197237	0.171577	-1.149551	0.2601
D(LGDPQ(-1),2)	-0.061806	0.189311	-0.326479	0.7465
D(LGDPQ(-2),2)	0.123942	0.189671	0.653460	0.5188
D(LGDPQ(-3),2)	0.173142	0.189703	0.912699	0.3692
D(LGDPQ(-4),2)	-0.392096	0.182226	-2.151696	0.0402
C	0.004779	0.004730	1.010204	0.3210
R-squared	0.353969	Mean dependent var	-0.000327	
Adjusted R-squared	0.238606	S.D. dependent var	0.008093	
S.E. of regression	0.007062	Akaike info criterion	-6.909490	
Sum squared resid	0.001396	Schwarz criterion	-6.640132	
Log likelihood	123.4613	Hannan-Quinn criter.	-6.817631	
F-statistic	3.068314	Durbin-Watson stat	2.005570	
Prob(F-statistic)	0.024806			

Null Hypothesis: D(LGDPQ) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.967930	0.1552
Test critical values: 1% level	-4.243644	
5% level	-3.544284	
10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDPQ,2)
Method: Least Squares
Date: 06/11/19 Time: 12:53
Sample (adjusted): 2010Q2 2018Q4
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDPQ(-1))	-0.491937	0.165751	-2.967930	0.0060
D(LGDPQ(-1),2)	0.017263	0.190044	0.090837	0.9282
D(LGDPQ(-2),2)	0.234948	0.185346	1.267619	0.2150
D(LGDPQ(-3),2)	0.365729	0.170857	2.140559	0.0408
C	0.018041	0.006245	2.888755	0.0072
@TREND("2009Q1")	-0.000247	0.000132	-1.872278	0.0713
R-squared	0.327967	Mean dependent var	-0.000330	
Adjusted R-squared	0.212099	S.D. dependent var	0.007973	
S.E. of regression	0.007077	Akaike info criterion	-6.909096	
Sum squared resid	0.001452	Schwarz criterion	-6.642465	
Log likelihood	126.9092	Hannan-Quinn criter.	-6.817055	
F-statistic	2.830530	Durbin-Watson stat	1.752200	
Prob(F-statistic)	0.033561			

Null Hypothesis: D(LINFLATION__P_) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.883221	0.0000
Test critical values: 1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINFLATION__P_,2)
Method: Least Squares
Date: 06/11/19 Time: 12:55
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINFLATION__P_(-1))	-1.131042	0.164319	-6.883221	0.0000
C	0.014837	0.002594	5.720270	0.0000
R-squared	0.568235	Mean dependent var	-0.000304	
Adjusted R-squared	0.556242	S.D. dependent var	0.012718	
S.E. of regression	0.008472	Akaike info criterion	-6.652885	
Sum squared resid	0.002584	Schwarz criterion	-6.566696	
Log likelihood	128.4048	Hannan-Quinn criter.	-6.622220	
F-statistic	47.37874	Durbin-Watson stat	2.010699	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINFLATION__P_) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.820992	0.0000
Test critical values: 1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINFLATION__P_,2)
Method: Least Squares
Date: 06/11/19 Time: 12:56
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINFLATION__P_(-1))	-1.136894	0.166676	-6.820992	0.0000
C	0.016089	0.003822	4.209511	0.0002
@TREND("2009Q1")	-5.73E-05	0.000127	-0.450440	0.6552
R-squared	0.570724	Mean dependent var	-0.000304	
Adjusted R-squared	0.546194	S.D. dependent var	0.012718	
S.E. of regression	0.008567	Akaike info criterion	-6.606034	
Sum squared resid	0.002569	Schwarz criterion	-6.476751	
Log likelihood	128.5146	Hannan-Quinn criter.	-6.560036	
F-statistic	23.26629	Durbin-Watson stat	2.010856	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINTEREST_R) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.943692	0.0000
Test critical values: 1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LINTEREST_R,2)
 Method: Least Squares
 Date: 06/11/19 Time: 12:57
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINTEREST_R(-1))	-0.570591	0.095999	-5.943692	0.0000
C	-3.16E-05	0.005541	-0.005696	0.9955
R-squared	0.495286	Mean dependent var		0.006603
Adjusted R-squared	0.481266	S.D. dependent var		0.046457
S.E. of regression	0.033460	Akaike info criterion		-3.905764
Sum squared resid	0.040303	Schwarz criterion		-3.819576
Log likelihood	76.20952	Hannan-Quinn criter.		-3.875099
F-statistic	35.32747	Durbin-Watson stat		2.265656
Prob(F-statistic)	0.000001			

Null Hypothesis: D(LINTEREST_R) has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.756567	0.0002
Test critical values: 1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LINTEREST_R,2)
 Method: Least Squares
 Date: 06/11/19 Time: 12:58
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINTEREST_R(-1))	-0.635074	0.110322	-5.756567	0.0000
C	-0.014403	0.013482	-1.068301	0.2927
@TREND("2009Q1")	0.000664	0.000569	1.168112	0.2507
R-squared	0.514224	Mean dependent var		0.006603
Adjusted R-squared	0.486465	S.D. dependent var		0.046457
S.E. of regression	0.033291	Akaike info criterion		-3.891377
Sum squared resid	0.038791	Schwarz criterion		-3.762094
Log likelihood	76.93617	Hannan-Quinn criter.		-3.845380
F-statistic	18.52482	Durbin-Watson stat		2.209609
Prob(F-statistic)	0.000003			

Null Hypothesis: D(LBANK_LENDING) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-9.345024	0.0000
Test critical values:		
1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000916
HAC corrected variance (Bartlett kernel)	0.001539

Phillips-Perron Test Equation
Dependent Variable: D(LBANK_LENDING,2)
Method: Least Squares
Date: 06/11/19 Time: 13:02
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBANK_LENDING(-1))	-1.187363	0.110758	-10.72029	0.0000
C	-0.001127	0.005084	-0.221763	0.8258
R-squared	0.761470	Mean dependent var		0.005690
Adjusted R-squared	0.754845	S.D. dependent var		0.062793
S.E. of regression	0.031091	Akaike info criterion		-4.052619
Sum squared resid	0.034799	Schwarz criterion		-3.966430
Log likelihood	78.99976	Hannan-Quinn criter.		-4.021954
F-statistic	114.9247	Durbin-Watson stat		2.000876
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBANK_LENDING) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-11.04650	0.0000
Test critical values:		
1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000768
HAC corrected variance (Bartlett kernel)	0.000918

Phillips-Perron Test Equation
Dependent Variable: D(LBANK_LENDING,2)
Method: Least Squares
Date: 06/11/19 Time: 13:03
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBANK_LENDING(-1))	-1.293413	0.110725	-11.68133	0.0000
C	-0.026168	0.010753	-2.433491	0.0202
@TREND("2009Q1")	0.001192	0.000460	2.591968	0.0138
R-squared	0.799883	Mean dependent var		0.005690
Adjusted R-squared	0.788448	S.D. dependent var		0.062793
S.E. of regression	0.028881	Akaike info criterion		-4.175579
Sum squared resid	0.029195	Schwarz criterion		-4.046296
Log likelihood	82.33601	Hannan-Quinn criter.		-4.129581
F-statistic	69.94889	Durbin-Watson stat		2.146477
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINFLATION__P_) has a unit root
Exogenous: Constant
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-8.797274	0.0000
Test critical values: 1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	6.80E-05
HAC corrected variance (Bartlett kernel)	1.96E-05

Phillips-Perron Test Equation
Dependent Variable: D(LINFLATION__P_,2)
Method: Least Squares
Date: 06/11/19 Time: 13:05
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINFLATION__P_(-1))	-1.131042	0.164319	-6.883221	0.0000
C	0.014837	0.002594	5.720270	0.0000
R-squared	0.568235	Mean dependent var		-0.000304
Adjusted R-squared	0.556242	S.D. dependent var		0.012718
S.E. of regression	0.008472	Akaike info criterion		-6.652885
Sum squared resid	0.002584	Schwarz criterion		-6.566696
Log likelihood	128.4048	Hannan-Quinn criter.		-6.622220
F-statistic	47.37874	Durbin-Watson stat		2.010699
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINFLATION__P_) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-8.734593	0.0000
Test critical values: 1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	6.76E-05
HAC corrected variance (Bartlett kernel)	1.91E-05

Phillips-Perron Test Equation
Dependent Variable: D(LINFLATION__P_,2)
Method: Least Squares
Date: 06/11/19 Time: 13:06
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINFLATION__P_(-1))	-1.136894	0.166676	-6.820992	0.0000
C	0.016089	0.003822	4.209511	0.0002
@TREND("2009Q1")	-5.73E-05	0.000127	-0.450440	0.6552
R-squared	0.570724	Mean dependent var		-0.000304
Adjusted R-squared	0.546194	S.D. dependent var		0.012718
S.E. of regression	0.008567	Akaike info criterion		-6.606034
Sum squared resid	0.002569	Schwarz criterion		-6.476751
Log likelihood	128.5146	Hannan-Quinn criter.		-6.560036
F-statistic	23.26629	Durbin-Watson stat		2.010856
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINTEREST_R) has a unit root
 Exogenous: Constant
 Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-6.140027	0.0000
Test critical values:		
1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001061
HAC corrected variance (Bartlett kernel)	0.000913

Phillips-Perron Test Equation
 Dependent Variable: D(LINTEREST_R,2)
 Method: Least Squares
 Date: 06/11/19 Time: 13:07
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINTEREST_R(-1))	-0.570591	0.095999	-5.943692	0.0000
C	-3.16E-05	0.005541	-0.005696	0.9955
R-squared	0.495286	Mean dependent var		0.006603
Adjusted R-squared	0.481266	S.D. dependent var		0.046457
S.E. of regression	0.033460	Akaike info criterion		-3.905764
Sum squared resid	0.040303	Schwarz criterion		-3.819576
Log likelihood	76.20952	Hannan-Quinn criter.		-3.875099
F-statistic	35.32747	Durbin-Watson stat		2.265656
Prob(F-statistic)	0.000001			

Null Hypothesis: D(LINTEREST_R) has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-5.756567	0.0002
Test critical values:		
1% level	-4.219126	
5% level	-3.533083	
10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001021
HAC corrected variance (Bartlett kernel)	0.001021

Phillips-Perron Test Equation
 Dependent Variable: D(LINTEREST_R,2)
 Method: Least Squares
 Date: 06/11/19 Time: 13:10
 Sample (adjusted): 2009Q3 2018Q4
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINTEREST_R(-1))	-0.635074	0.110322	-5.756567	0.0000
C	-0.014403	0.013482	-1.068301	0.2927
@TREND("2009Q1")	0.000664	0.000569	1.168112	0.2507
R-squared	0.514224	Mean dependent var		0.006603
Adjusted R-squared	0.486465	S.D. dependent var		0.046457
S.E. of regression	0.033291	Akaike info criterion		-3.891377
Sum squared resid	0.038791	Schwarz criterion		-3.762094
Log likelihood	76.93617	Hannan-Quinn criter.		-3.845380
F-statistic	18.52482	Durbin-Watson stat		2.209609
Prob(F-statistic)	0.000003			

Dependent Variable: LGDPQ
Method: Least Squares
Date: 06/11/19 Time: 13:36
Sample: 2009Q1 2018Q4
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.898965	0.217045	13.35651	0.0000
LBANK_LENDING	-0.635447	0.144374	-4.401381	0.0001
LINFLATION__P_	2.080556	0.028047	74.18107	0.0000
LINTEREST_R	0.311180	0.086175	3.611028	0.0009
R-squared	0.993521	Mean dependent var		11.73011
Adjusted R-squared	0.992981	S.D. dependent var		0.322787
S.E. of regression	0.027044	Akaike info criterion		-4.288090
Sum squared resid	0.026329	Schwarz criterion		-4.119202
Log likelihood	89.76180	Hannan-Quinn criter.		-4.227026
F-statistic	1840.023	Durbin-Watson stat		1.045175
Prob(F-statistic)	0.000000			

Vector Autoregression Estimates

Date: 06/11/19 Time: 13:46
Sample (adjusted): 2009Q3 2018Q4
Included observations: 38 after adjustments

Standard errors in () & t-statistics in []

	LGDPQ
LGDPQ(-1)	1.654331 (0.12676) [13.0508]
LGDPQ(-2)	-0.660538 (0.12547) [-5.26439]
C	0.081248 (0.04753) [1.70936]
R-squared	0.999493
Adj. R-squared	0.999464
Sum sq. resids	0.001763
S.E. equation	0.007098
F-statistic	34512.36
Log likelihood	135.6662
Akaike AIC	-6.982431
Schwarz SC	-6.853148
Mean dependent	11.75784
S.D. dependent	0.306641

VAR Lag Order Selection Criteria

Endogenous variables: LGDPQ

Exogenous variables: C

Date: 06/11/19 Time: 13:54

Sample: 2009Q1 2018Q4

Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7.239041	NA	0.091400	0.445354	0.488892	0.460703
1	121.2045	243.0013	9.32e-05	-6.443486	-6.356409	-6.412787
2	131.7656	19.40958*	5.56e-05*	-6.960302*	-6.829687*	-6.914254*
3	132.1055	0.606391	5.76e-05	-6.924623	-6.750470	-6.863226

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

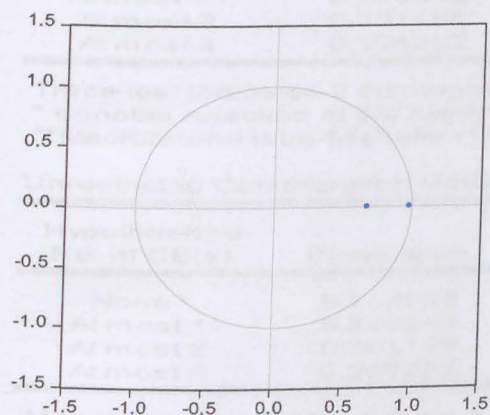
HQ: Hannan-Quinn information criterion

Roots of Characteristic Polynomial
 Endogenous variables: LGDPQ
 Exogenous variables: C
 Lag specification: 1 2
 Date: 06/11/19 Time: 14:01

Root	Modulus
0.981000	0.981000
0.673331	0.673331

No root lies outside the unit circle.
 VAR satisfies the stability condition.

Inverse Roots of AR Characteristic Polynomial



Date: 06/11/19 Time: 14:12
Sample (adjusted): 2009Q4 2018Q4
Included observations: 37 after adjustments
Trend assumption: Linear deterministic trend
Series: LGDPQ LBANK_LENDING LINFLATION__P_LINTEREST_R
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.719993	77.68489	47.85613	0.0000
At most 1 *	0.370049	30.58605	29.79707	0.0405
At most 2	0.301105	13.48784	15.49471	0.0981
At most 3	0.006262	0.232431	3.841466	0.6297

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.719993	47.09883	27.58434	0.0001
At most 1	0.370049	17.09821	21.13162	0.1674
At most 2	0.301105	13.25541	14.26460	0.0717
At most 3	0.006262	0.232431	3.841466	0.6297

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b**S11*b=I):

LGDPQ	LBANK_LEND...	LINFLATION_...	LINTEREST_R
-6.327303	-56.55355	20.34346	31.62755
42.45928	39.62173	-86.15391	-29.45809
-36.46092	-50.48101	72.87633	19.74077
-32.46550	-11.83973	75.62576	0.623201

Unrestricted Adjustment Coefficients (alpha):

D(LGDPQ)	-0.000525	-0.000142	0.003236	0.000249
D(LBANK_L...	0.021255	0.002471	0.000648	1.81E-06
D(LINFLATIO...	0.001674	0.001429	-0.000274	0.000487
D(LINTERES...	0.010665	0.017029	0.002566	0.000150

1 Cointegrating Equation(s): Log likelihood 461.0676

Normalized cointegrating coefficients (standard error in parentheses)

LGDPQ	LBANK_LEND...	LINFLATION_...	LINTEREST_R
1.000000	8.938018	-3.215187	-4.998584
	(1.06497)	(0.21445)	(0.63547)

Adjustment coefficients (standard error in parentheses)

D(LGDPQ)	0.003320
	(0.00815)
D(LBANK_L...	-0.134486
	(0.01694)
D(LINFLATIO...	-0.010591
	(0.00815)
D(LINTERES...	-0.067482
	(0.03557)

2 Cointegrating Equation(s): Log likelihood 469.6168

Normalized cointegrating coefficients (standard error in parentheses)

LGDPQ	LBANK_LEND...	LINFLATION_...	LINTEREST_R
1.000000	0.000000	-1.890826	-0.191963
		(0.07627)	(0.08595)
0.000000	1.000000	-0.148172	-0.537773
		(0.02719)	(0.03064)

Adjustment coefficients (standard error in parentheses)

VAR Residual Serial Correlation LM Tests

Date: 06/11/19 Time: 14:46

Sample: 2009Q1 2018Q4

Included observations: 38

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	25.79309	16	0.0570	1.744685	(16, 67.8)	0.0588
2	15.63662	16	0.4786	0.985221	(16, 67.8)	0.4825

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	25.79309	16	0.0570	1.744685	(16, 67.8)	0.0588
2	34.89894	32	0.3318	1.110687	(32, 68.0)	0.3509

*Edgeworth expansion corrected likelihood ratio statistic.

VAR Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: Residuals are multivariate normal

Date: 06/11/19 Time: 14:50

Sample: 2009Q1 2018Q4

Included observations: 38

Component	Skewness	Chi-sq	df	Prob.*
1	0.352391	0.786468	1	0.3752
2	-0.193746	0.237737	1	0.6258
3	0.299671	0.568752	1	0.4508
4	-0.611276	2.366502	1	0.1240
Joint		3.959459	4	0.4115

Component	Kurtosis	Chi-sq	df	Prob.
1	6.729544	22.02337	1	0.0000
2	2.876382	0.024196	1	0.8764
3	2.717381	0.126466	1	0.7221
4	4.132500	2.030715	1	0.1541
Joint		24.20475	4	0.0001

Component	Jarque-Bera	df	Prob.
1	22.80984	2	0.0000
2	0.261933	2	0.8772
3	0.695218	2	0.7064
4	4.397217	2	0.1110
Joint	28.16421	8	0.0004

*Approximate p-values do not account for coefficient estimation

Variance Decomposition of LGDPQ:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.007196	100.0000	0.000000	0.000000	0.000000
2	0.013290	99.10909	0.000336	0.741107	0.149470
3	0.018448	98.64990	0.072337	1.153864	0.123903
4	0.022713	98.47049	0.231267	1.196548	0.101691
5	0.026429	98.05684	0.522713	1.150999	0.269447
6	0.029788	97.31849	0.941221	1.128167	0.612121
7	0.032860	96.32743	1.427720	1.155046	1.089802
8	0.035689	95.13996	1.934730	1.232010	1.693303
9	0.038317	93.79922	2.430991	1.357390	2.412401
10	0.040778	92.35101	2.892327	1.534391	3.222272
11	0.043097	90.84049	3.300113	1.768070	4.091331
12	0.045290	89.30633	3.642119	2.061636	4.989912
13	0.047369	87.77944	3.912678	2.415398	5.892481
14	0.049342	86.28422	4.111650	2.827217	6.776911
15	0.051217	84.83981	4.242939	3.292982	7.624266
16	0.052998	83.46072	4.313206	3.806831	8.419247
17	0.054691	82.15735	4.330817	4.361353	9.150476
18	0.056299	80.93672	4.304971	4.947965	9.810345
19	0.057826	79.80303	4.244977	5.557367	10.39463
20	0.059276	78.75826	4.159701	6.180005	10.90204

Variance Decomposition of LBANK_LENDING:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.021754	0.714461	99.28554	0.000000	0.000000
2	0.026665	4.746050	81.33588	8.771604	5.146467
3	0.031111	4.547874	69.89485	10.71904	14.83823
4	0.034524	3.735856	66.97705	9.789157	19.49794
5	0.036713	3.338753	65.56103	8.759533	22.34069
6	0.038421	3.168899	63.81365	8.008456	25.00899
7	0.039902	3.151801	61.74612	7.540090	27.56199
8	0.041161	3.223603	59.62680	7.381806	29.76779
9	0.042213	3.350750	57.60121	7.559224	31.48881
10	0.043095	3.527918	55.70746	8.032005	32.73261
11	0.043846	3.747248	53.97605	8.718319	33.55838
12	0.044492	3.992185	52.44753	9.536975	34.02331
13	0.045052	4.245735	51.15199	10.41888	34.18340
14	0.045543	4.495025	50.10060	11.30343	34.10095
15	0.045975	4.730861	49.28824	12.13811	33.84279
16	0.046361	4.946451	48.69746	12.88207	33.47402
17	0.046708	5.137006	48.30140	13.50867	33.05293
18	0.047021	5.299823	48.06697	14.00506	32.62815
19	0.047306	5.434186	47.95816	14.37033	32.23732
20	0.047565	5.541006	47.93916	14.61312	31.90672

Variance Decomposition of LINFLATION_P:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.008116	24.50425	4.607221	70.88853	0.000000
2	0.010558	32.47807	2.730935	63.44054	1.350460
3	0.012313	39.14719	2.838430	53.83656	4.177822
4	0.014292	46.68289	2.427511	45.54366	5.345940
5	0.016226	52.74323	2.001057	40.12604	5.129668
6	0.017937	56.84379	1.747443	36.60778	4.800987
7	0.019441	59.82383	1.558361	33.98092	4.636896
8	0.020798	62.19696	1.392456	31.83167	4.578913
9	0.022048	64.15224	1.248307	30.03805	4.561404
10	0.023210	65.76986	1.127408	28.53355	4.569181
11	0.024294	67.10643	1.029545	27.25593	4.608096
12	0.025311	68.21026	0.953263	26.15531	4.681163
13	0.026270	69.11950	0.896723	25.19845	4.785325
14	0.027181	69.86277	0.857700	24.36366	4.915875
15	0.028047	70.46240	0.833583	23.63502	5.068995
16	0.028875	70.93726	0.821595	22.99961	5.241537
17	0.029667	71.30400	0.818974	22.44675	5.430279
18	0.030427	71.57761	0.823100	21.96757	5.631719
19	0.031157	71.77155	0.831585	21.55461	5.842255
20	0.031858	71.89796	0.842358	21.20132	6.058363

Variance Decomposition of LINTEREST_R:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.031006	0.407691	36.49401	4.671892	58.42641
2	0.045517	0.212573	40.24256	5.333181	54.21169
3	0.052724	0.328771	41.59696	4.026712	54.04756
4	0.057747	0.308545	41.77773	3.757273	54.15646
5	0.061791	0.300625	40.51401	4.045092	55.14027
6	0.065257	0.387665	38.56528	4.656369	56.39069
7	0.068179	0.498418	36.54513	5.660039	57.29642
8	0.070603	0.622403	34.62674	7.045222	57.70563
9	0.072642	0.766666	32.87960	8.678638	57.67510
10	0.074384	0.925776	31.37400	10.40648	57.29375
11	0.075884	1.086003	30.15835	12.11946	56.63618
12	0.077183	1.235620	29.24893	13.74324	55.77221
13	0.078316	1.368071	28.63626	15.21878	54.77689
14	0.079310	1.480024	28.29304	16.50109	53.72584
15	0.080187	1.569812	28.17968	17.56400	52.68651
16	0.080964	1.637244	28.24920	18.40051	51.71306
17	0.081652	1.683647	28.45218	19.01932	50.84485
18	0.082264	1.711582	28.74089	19.44077	50.10675
19	0.082806	1.724375	29.07238	19.69302	49.51022
20	0.083286	1.725694	29.41055	19.80863	49.05512

Cholesky Ordering: LGDPQ LBANK_LENDING LINFLATION_P LINTEREST_R

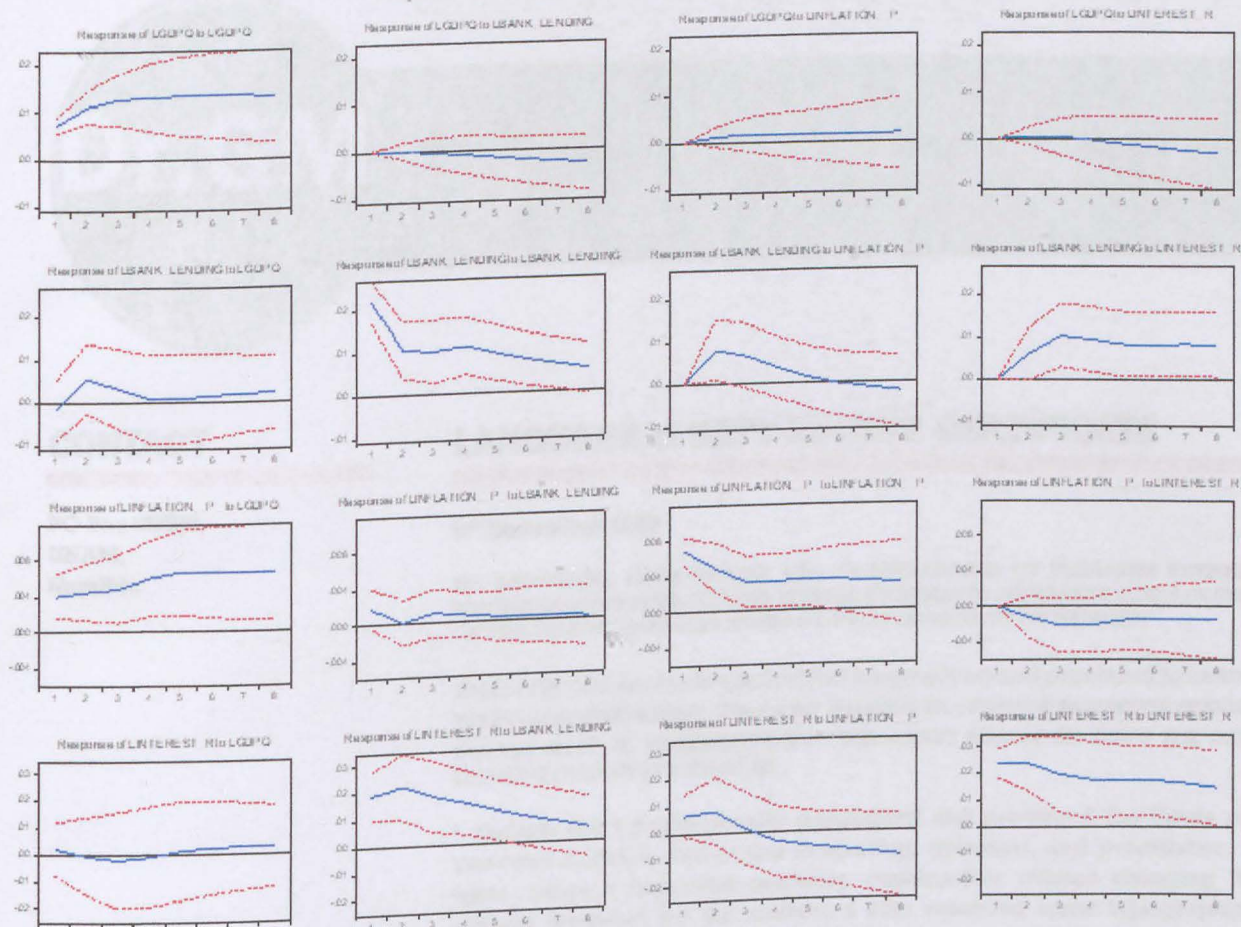
Variance Decomposition of LGDPQ:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.007196	100.0000	0.000000	0.000000	0.000000
2	0.013290	99.10909	0.000336	0.741107	0.149470
3	0.018448	98.64990	0.072337	1.153864	0.123903
4	0.022713	98.47049	0.231267	1.196548	0.101691
5	0.026429	98.05684	0.522713	1.150999	0.269447
6	0.029788	97.31849	0.941221	1.128167	0.612121
7	0.032860	96.32743	1.427720	1.155046	1.089802
8	0.035689	95.13996	1.934730	1.232010	1.693303
9	0.038317	93.79922	2.430991	1.357390	2.412401
10	0.040778	92.35101	2.892327	1.534391	3.222272
11	0.043097	90.84049	3.300113	1.768070	4.091331
12	0.045290	89.30633	3.642119	2.061636	4.989912
13	0.047369	87.77944	3.912678	2.415398	5.892481
14	0.049342	86.28422	4.111650	2.827217	6.776911
15	0.051217	84.83981	4.242939	3.292982	7.624266
16	0.052998	83.46072	4.313206	3.806831	8.419247
17	0.054691	82.15735	4.330817	4.361353	9.150476
18	0.056299	80.93672	4.304971	4.947965	9.810345
19	0.057826	79.80303	4.244977	5.557367	10.39463
20	0.059276	78.75826	4.159701	6.180005	10.90204

Variance Decomposition of LBANK_LENDING:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.021754	0.714461	99.28554	0.000000	0.000000
2	0.026665	4.746050	81.33588	8.771604	5.146467
3	0.031111	4.547874	69.89485	10.71904	14.83823
4	0.034524	3.735856	66.97705	9.789157	19.49794
5	0.036713	3.338753	65.56103	8.759533	22.34069
6	0.038421	3.168899	63.81365	8.008456	25.00899
7	0.039902	3.151801	61.74612	7.540090	27.56199
8	0.041161	3.223603	59.62680	7.381806	29.76779
9	0.042213	3.350750	57.60121	7.559224	31.48881
10	0.043095	3.527918	55.70746	8.032005	32.73261
11	0.043846	3.747248	53.97605	8.718319	33.55838
12	0.044492	3.992185	52.44753	9.536975	34.02331
13	0.045052	4.245735	51.15199	10.41888	34.18340
14	0.045543	4.495025	50.10060	11.30343	34.10095
15	0.045975	4.730861	49.28824	12.13811	33.84279
16	0.046361	4.946451	48.69746	12.88207	33.47402
17	0.046708	5.137006	48.30140	13.50867	33.05293
18	0.047021	5.299823	48.06697	14.00506	32.62815
19	0.047306	5.434186	47.95816	14.37033	32.23732
20	0.047565	5.541006	47.93916	14.61312	31.90672

Variance Decomposition of LINFLATION_P:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.008116	24.50425	4.607221	70.88853	0.000000
2	0.010558	32.47807	2.730935	63.44054	1.350460
3	0.012313	39.14719	2.838430	53.83656	4.177822
4	0.014292	46.68289	2.427511	45.54366	5.345940
5	0.016226	52.74323	2.001057	40.12604	5.129668
6	0.017937	56.84379	1.747443	36.60778	4.800987
7	0.019441	59.82383	1.558361	33.98092	4.636896
8	0.020798	62.19696	1.392456	31.83167	4.578913
9	0.022048	64.15224	1.248307	30.03805	4.561404
10	0.023210	65.76986	1.127408	28.53355	4.569181
11	0.024294	67.10643	1.029545	27.25593	4.608096
12	0.025311	68.21026	0.953263	26.15531	4.681163
13	0.026270	69.11950	0.896723	25.19845	4.785325
14	0.027181	69.86277	0.857700	24.36366	4.915875
15	0.028047	70.46240	0.833583	23.63502	5.068995
16	0.028875	70.93726	0.821595	22.99961	5.241537
17	0.029667	71.30400	0.818974	22.44675	5.430279
18	0.030427	71.57761	0.823100	21.96757	5.631719
19	0.031157	71.77155	0.831585	21.55461	5.842255
20	0.031858	71.89796	0.842358	21.20132	6.058363

Variance Decomposition of LINTEREST_R:					
Period	S.E.	LGDPQ	LBANK_L...	LINFLATIO...	LINTERES...
1	0.031006	0.407691	36.49401	4.671892	58.42641
2	0.045517	0.212573	40.24256	5.333181	54.21169
3	0.052724	0.328771	41.59696	4.026712	54.04756
4	0.057747	0.308545	41.77773	3.757273	54.15646
5	0.061791	0.300625	40.51401	4.045092	55.14027
6	0.065257	0.387665	38.56528	4.656369	56.39069
7	0.068179	0.498418	36.54513	5.660039	57.29642
8	0.070603	0.622403	34.62674	7.045222	57.70563
9	0.072642	0.766666	32.87960	8.678638	57.67510
10	0.074384	0.925776	31.37400	10.40648	57.29375
11	0.075884	1.086003	30.15835	12.11946	56.63618
12	0.077183	1.235620	29.24893	13.74324	55.77221
13	0.078316	1.368071	28.63626	15.21878	54.77689
14	0.079310	1.480024	28.29304	16.50109	53.72584
15	0.080187	1.569812	28.17968	17.56400	52.68651

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.



Dr.GM

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LANGUAGE & COPY-EDITING CERTIFICATE

9th November 2019

RE: LANGUAGE, COPYEDITING AND PROOFREADING OF JOHANNES PEYAVALI MUSHELENGA's THESIS FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE OF THE NAMIBIA BUSINESS SCHOOL OF THE UNIVERSITY OF NAMIBIA

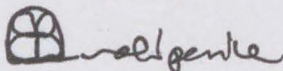
This certificate serves to confirm that I copyedited and proofread **JOHANNES PEYAVALI MUSHELENGA's Thesis** for the **MASTER OF BUSINESS ADMINISTRATION DEGREE** entitled: **TRANSMISSION OF MONETARY POLICY THROUGH THE BANK LENDING CHANNEL IN NAMIBIA**

I declare that I professionally copyedited and proofread the thesis and removed mistakes and errors in spelling, grammar, and punctuation. In some cases, I improved sentence construction without changing the content provided by the student. I also removed some typographical errors from the thesis and formatted the thesis so that it complies with the University of Namibia's guidelines.

I am a trained language and copy editor and have edited many Postgraduate Diploma, Masters' Thesis, Dissertations and Doctoral Dissertations for students studying with universities in Namibia, Zimbabwe, Swaziland, South Africa and abroad. I have also copy-edited company documents for companies in the region and abroad.

Please feel free to contact me should the need arise.

Yours Sincerely,



The Rev. Dr. Greenfield Mwakipesile



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